LONDON-WEST MIDLANDS ENVIRONMENTAL STATEMENT

Volume 5 | Technical Appendices

CFA16-22 | Ladbroke to Handsacre

Ecological baseline data: invertebrates and fish (EC-004-003)

Ecology

November 2013

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Department for Transport

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Appendix EC-004-003

Environmental topic:	Ecology	EC
Appendix name:	Ecological baseline data (CFA16-CFA22): invertebrates and fish	004-003
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1 Introduction

1.1.1 This document is an appendix which forms part of Volume 5 of the Environmental Statement (ES) for the Proposed Scheme. It details ecological baseline data collected for the following community forum area (CFA):

- CFA16: Ladbroke and Southam;
- CFA17: Offchurch and Cubbington;
- CFA18: Stoneleigh, Kenilworth and Burton Green;
- CFA19: Coleshill Junction;
- CFA20: Curdworth to Middleton;
- CFA21: Drayton Bassett, Hints and Weeford; and
- CFA22: Whittington to Handsacre.

1.1.2 The document should be read in conjunction with Volume 2 (Community forum area reports), Volume 3 (Route wide effects) and Volume 4 (Off-route effects).

2 Terrestrial Invertebrates

2.1 Introduction

2.1.1 This section of the appendix presents details of the terrestrial invertebrate surveys conducted for sections of the Proposed Scheme that will pass through CFA16 to 22 inclusive.

2.2 Methodology

2.2.1 Details of the standard methodology utilised for terrestrial invertebrate survey are provided in Ecology technical note: Ecological field survey methods and standards (Volume5: Appendix CT-001-000/2).

2.2.2 Desk study records relating to terrestrial invertebrates were obtained from the following sources:

- Warwickshire Biological Records Centre;
- Staffordshire Ecological Record;
- discussions with and information from Warwickshire flies and aculeate hymenoptera recorder, Warwickshire beetle recorder, and Warwickshire Butterfly Conservation Warwickshire Branch representative;
- the Butterfly Conservation website (butterfly-conservation.org);
- Bees, Wasps and Ants Recording Society (BWARS), an active Society with recording at its core. It has the most complete and up-to-date dataset of bees and wasps in the UK;
- the Hoverfly Recording Scheme dataset, similar to the BWARS dataset, this is the primary source of information for hoverflies. BWARS was consulted on one occasion in relation to a specialist hoverfly (*Xylota florum*);
- data files and distribution map of glow worms in Warwickshire from the Warwickshire Coleoptera (beetle) recorder; and
- verbal information from local wildlife recorders during meetings arranged by Warwickshire County Council and Warwickshire Wildlife Trust in June and November 2012.

2.2.3 Desk study data within 5km of the route of the Proposed Scheme, together with aerial photography to assess habitats, was used to determine key invertebrate groups likely to be present within the land required for construction of the Proposed Scheme. Available terrestrial invertebrate data in Warwickshire and Staffordshire indicates that key species are likely to be high fidelity[1] rot-hole specialist flies; therefore the sites selected for survey include woodlands and parkland/boundary trees that might support these features. Surveys were also carried out within habitats representative of

[1] Found in association with a particular habitat type.

the general agricultural habitat within the land required for construction of the Proposed Scheme.

2.2.4 An initial scoping visit was carried out at the sites identified, where access was available. Between one and three survey visits were carried out at each site; some sites were scoped out of further survey following the initial visit due to the presence of poor quality invertebrate habitat. Some sites considered to have enough invertebrate interest for further survey only required an additional visit to collect enough data to assess the importance of the site for invertebrates. A third visit was carried out at some sites where a seasonal difference in the invertebrate assemblage was anticipated. In this case survey visits were carried out in spring, summer and autumn where access was available during these periods, including an autumn visit to woodland habitats.

2.2.5 The terrestrial invertebrate surveys covered all groups and species applicable to non-aquatic habitats. Aquatic macro invertebrates are dealt with in Section 3 of this appendix. Typically there are key groups within each habitat type that are useful indicators for assessing habitat quality; it is these groups and flagship species that formed the basis of the invertebrate sampling and assessments. Flagship species are key species for a particular habitat or location. Often they are also scarce, or have another national status such as being a species of principal importance identified in Section 41 of the Natural Environment and Rural Communities (NERC) Act (2006)[2]. Examples of flagship species which are species of principal importance include: the dingy skipper (*Erynnis tages*), a flagship species for brown field open mosaic sites; the small blue butterfly, a flagship species of calcareous grasslands in Warwickshire; and the white admiral butterfly, a flagship species of good quality broadleaved woodlands.

2.2.6 Standardised sampling was conducted based on Natural England guidance[3] (four, eight or exceptionally 12 samples of normally 20 minute units using sweep netting). Sampling information was then used to identify key groups to indicate the value of the assemblage. No pitfall trapping or light trapping for moths was undertaken within CFA16 to 22 as these methods would have been largely unproductive due to poor weather conditions (see paragraph 2.3.2) and the type of habitats surveyed. The following sampling methodologies were used:

- sweeping – capture of invertebrates using a net. Sweeping is the most widely used method for capture of a wide range of invertebrates, but is most effective for groups such as bees, wasps, heteroptera (true bugs) and flies;
- grubbing is the hand searching of physical features. This method is most frequently undertaken on deadwood features such as under bark, within rotting timber, in leaf and soil debris and under logs lying on the ground. It is also used on open mosaic sites to collect ground beetles and ground dwelling heteroptera (true bugs); and
- incidental recording is the visual recording of conspicuous insects such as butterflies, dragonflies, larger flies and some bees and wasps that are easily

[2] Natural Environment and Rural Communities Act 2006 (Chapter 16). Her Majesty's Stationery Office.
[3] Drake, Martin. et al. (2007), NERR005; Surveying terrestrial and freshwater invertebrates for conservation evaluation. *Natural England*; Peterborough.

recognisable in the field.

2.2.7 Where standardised sampling was deemed to be inappropriate, for example when the surveyed habitat was not large enough to accommodate several sampling points or the survey was highly focussed, as with rot hole investigations, then the surveyor made a decision on when to terminate survey based on professional judgement (i.e. once the surveyor felt they had gained sufficient data to adequately assess and evaluate the site or features).

2.2.8 The Invertebrate Species habitat Information System (ISIS) has been used to assess some invertebrate assemblages recorded from field surveys where sufficient data has been collected to allow analysis. ISIS is a computer application that can be used to identify assemblages of importance based on species lists[4]. This is particularly useful for identifying key areas of invertebrate importance and monitoring site changes as management alters habitat structure and species composition. ISIS analyses invertebrate assemblages in accordance with the following categories:

- BAT (Broad Assemblage Type) – these are widespread habitat types and associated species. Their classification reflects environmental factors such as hydrology and disturbance cycles; and
- SAT (Specific Assemblage Type) – these are characterised by stenotopic species (those that can only withstand a narrow range of environmental conditions) which have intrinsic conservation value. SAT are more tightly defined than BAT and sit within a parent BAT. More than one SAT can sit within a parent BAT such as:
  - BAT: F11 – unshaded early successional mosaic
  - SAT: F111 – bare sand and chalk
    F112 – open short sward
    F113 – exposed sea cliff

2.2.9 Evaluation of invertebrate assemblages recorded during surveys is based on the criteria in Table 1. These evaluation guidelines do not include species of principal importance. Therefore, in general, a species of principal importance has been equated to a nationally scarce species. A value given to an invertebrate assemblage is related to a pocket of similar habitat with which the assemblage would be associated. Where a large arable farmscape has been surveyed there may be several assemblages identified within that single site, and each one may require a separate assessment.

2.2.10 The following Red Data Book status was used to help value individual invertebrate species within an assemblage[5]:

- (RDB1) Red Data Book category 1 – Endangered: Species which are known or believed to occur as only a single population within one 10km square of the national grid;
- (RDB2) Red Data Book category 2 – Vulnerable: Species declining throughout

[4] Lott, Derek et al (2007), ISIS. Invertebrate Species – habitat Information System, 2008 build. *Natural England*. Peterborough.
[5] Shirt, David (1987), British Red data Books: 2. Insects; Nature Conservancy Council; Peterborough.

their range or in vulnerable habitats;

- (RDB3) Red Data Book category 3 – Rare: Species which are estimated to exist in only fifteen or fewer post 1970 10km squares. This criterion may be relaxed where populations are likely to exist in over fifteen 10km squares but occupy small areas of especially vulnerable habitat;
- (NSA) Nationally Notable (Scarce) category A – Notable A: Taxa which do not fall within the RDB category but which are nonetheless uncommon in Great Britain and thought to occur in 30 or fewer 10km squares of the National Grid or, for less well recorded groups between eight and twenty vice counties;
- (NSB) Nationally Notable (Scarce) category B – Notable B: Taxa which do not fall within the RDB category but which are nonetheless uncommon in Great Britain and thought to occur in 31 and 100 10km squares of the National Grid or, for less well recorded groups between eight and twenty vice counties; and
- (NS) Nationally Notable (Scarce) – Notable: Species which are estimated to occur within the range of 16 to 100 10km squares. The subdividing of this category into Notable A and Notable B has not been attempted for many species in this part of the review.

Table 1: Evaluation of terrestrial invertebrate assemblages adapted from; Plant, C. (2009)[6]

Value	Description	Minimum qualifying criteria
International	European important site (i.e. SAC)	Internationally important invertebrate populations present or containing RDB 1 (Endangered) species or any species protected under European legislation or containing habitats that are threatened or rare at the European level (including, but not exclusively so, habitats listed on the EU Habitats Directive[7]).
National	UK important site (SSSI)	Achieving Site of Special Scientific Interest (SSSI) invertebrate criteria[8] or containing RDB2 (Vulnerable) or viable populations of RDB 3 (Rare) species or viable populations of any species protected under UK legislation or containing habitats that are threatened or rare nationally (Great Britain).
Regional (for border sites, both regions must be taken into account)	Site with populations of invertebrates or invertebrate habitats considered scarce or rare or threatened	Habitat that is scarce or threatened in the region or which has, or is reasonably expected to have, the presence of an assemblage of invertebrates including at least ten Nationally Notable species or at least ten species listed as Regionally Notable for the English Nature region in question in the Recorder database[9] or elsewhere or a combination of these categories amounting to ten species in total.

[6] Plant, C. (2009), Invertebrates and Ecological Assessment and Criteria used to Define Significance of Invertebrate Habitat; IEEM; Unpublished document.
[7] Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora (the Habitats Directive).
[8] Nature Conservancy Council (1989), *Guidelines for the selection of biological SSSI's Part 2: Detailed guidelines for habitats and species groups*, Chapter 17 Invertebrates.
[9] Recorder 3 is a software package for entering, collating and exchanging records of species and habitats developed in the late 1980s by the Nature Conservancy Council (NCC). Ball, Stuart (1994), *Recorder* 3.3; Joint Nature Conservation Committee; Peterborough.

Value	Description	Minimum qualifying criteria
County/metropolitan (for border sites, both counties must be taken into account)	Site with populations of invertebrates or invertebrate habitats considered scarce or rare or threatened in the county/metropolitan area	Habitat that is scarce or threatened in the county and/or which contains or is reasonably expected to contain an assemblage of invertebrates that includes viable populations of at least five Nationally Notable species or viable populations of at least five species regarded as Regionally Scarce by the county records centres and/or field club.
District/borough	Site with populations of invertebrates or invertebrate habitats considered scarce or rare or threatened in the administrative district/borough	Habitats falling below county level, but which may be of greater importance than merely Local. They include sites for which Nationally Notable species in the range from one to four examples are reasonably expected but not yet necessarily recorded and where this omission is considered likely to be partly due to under-recording.
Local /parish	Site with populations of invertebrates or invertebrate habitats considered scarce or rare or threatened in the affected and neighbouring Parishes	Habitats or species unique or of some other significance within the local area.

2.3 Deviations, constraints and limitations

2.3.1 The low temperatures and high rainfall of 2012 and the protracted cold spring of 2013 affected numbers of terrestrial invertebrates during the survey period. Groups of terrestrial invertebrates particularly affected would have been flies, bees, wasps and butterflies.

2.3.2 All sites surveyed during 2012 and 2013 will have been influenced by the poor weather despite sampling on as many optimal days as possible (warm, dry and sunny). The level to which poor weather affected invertebrate assemblages cannot be accurately assessed without having comparative baseline data for each site sampled. However, the potentially negative effects of the weather have been taken into account in sampling assemblages rather than searching for key species in most instances and by using professional judgement about the quality of the habitat for terrestrial invertebrates alongside the results generated by ISIS.

2.4 Baseline

2.4.1 Table 2 provides a summary of those sites that were subject to initial scoping surveys, and were found not to warrant further detailed survey. Table 3 provides a summary of terrestrial invertebrate survey sites which had more than one visit. Table 4 provides a summary of protected and/or notable invertebrate species identified within CFA16 to 22 inclusive.

Table 2: Sites scoped out of requirement for further terrestrial invertebrate survey

Ecology survey code	Survey site/Location	OS Grid Reference	Description of proposed site and rationale for scoping out requirements for further survey	Survey date	CFA
30-IT-125001	Gaydon Road balancing pond	SP41026087	Small balancing pond surrounded by rank grass and scrub. Scoped out as lacked features of value and did not have extensive flowering plants present	07 May 2013	CFA16

Ecology survey code	Survey site/Location	OS Grid Reference	Description of proposed site and rationale for scoping out requirements for further survey	Survey date	CFA
030-IT-143001	Greens Wood, near Crackley	SP28887428	Small woodland. Scoped out as lacked understory and field layer structure and diversity. Trees were young to mature with no signs of dead wood.	18June 2012	CFA18
030-IT-146002	Little Poors Wood, Burton Green	SP26777584	Small woodland. Scoped out as the understory and canopy lacked diversity. The woodland was dominated by bracken and bramble with holly as dominant shrub layer plant.	18 July 2012	CFA18
030-IT-163001	Meadowcroft Pony Paddocks, Coleshill	SP18829012	Pony grazed paddocks with species poor hedgerows. Thought to contain bare ground and short turf swards suitable for dingy skipper from initial review of aerial photos but was found to support only short grazed grass and species poor hedgerows.	14 May 2013	CFA19
030-IT-168001	Cuttle Mill Fishery, south of Middleton	SP190295007	Woodland and fishing pools. Scoped out as it was found to be a commercial fishery with management of the pond edges and the woodland inappropriate to encourage diverse invertebrate assemblages, although wet woodland was present, these areas were too small and disturbed to contain species or assemblages of importance.	17 July 2012	CFA20
030-IT-176001	Roundhill Wood, west of Hints	SK15820233	Hilltop woodland. Scoped out as was found to be dominated by sycamore and rhododendron. There was one tree found with a sap run but no other trees of interest were found and the field layer was largely shaded out by the alien plants (rhododendron) apart from some areas of bluebell.	24 May 2012	CFA21
030-IT-188001	Brokendown Wood, near Fradley	SK13361360	Secondary birch woodland. Found to be disturbed, lacking structure and any typical woodland features of invertebrate interest. Ground flora dominated by bracken and bramble.	23 October 2012	CFA22
030-IT-188002	Land near Fradley Business Park	SK13011324	Small woodland and woodland pool. Scoped out as it was a small unit of woodland. Although there were some trees of potential interest in the woodland, these were shaded out and the scrub layer was dense.	07 October 12	CFA22
030-IT-189002	Black Slough Farm, south of Handsacre	SK12151366	Grazed pasture with trees. Scoped out as the pasture was of poor quality and the trees were largely mature with few signs of dead wood.	11 June 2012	CFA22
030-IT-190002	Shaw Lane, south of Handsacre	SK10451436	Woodland, arable, grazed pasture and trees. This mosaic was subject to a full day visit prior to scoping out. Sufficient data was attained from this visit to not warrant further visits due to the overall lack of quality of the habitats for invertebrates.	26 June 2012	CFA22

Table 3: Sites where further survey was carried out for terrestrial invertebrates

Ecology survey code	Survey site/location	OS Grid centroid	Survey dates	Survey type	CFA	Distance from the land required for construction of the Proposed Scheme[10] (m)
030-IT-120001	Ladbroke Hill Farm, east of Ladbroke	SP4292559144	17 May 2012, 20 August 2012 (bumblebee habitat assessment)	Sweeping, grubbing, incidental recording	CFA16	Within land required
030-IT-127001	Long Itchington and Ufton Woods, north of Ufton	SP3882562746	07 May 2013, 09 July 2013	Sweeping, spot sampling, grubbing and incidental recording	CFA16	The Proposed Scheme passes under the SSSSI in tunnel
030-IT-135001	South Cubbington Wood, east of Cubbington	SP3519268670	16 October 2012, 06 June 2013	Sweeping and incidental recording	CFA17	Adjacent to land required
030-IT-138001	Stoneleigh Park, south-east of Kenilworth	SP3273071514	30 July 2012, 15 October 2012, 21 May 2013	Sweeping, grubbing, incidental recording	CFA18	Within land required
030-IT-141001	Milburn Grange Farm, on the eastern edge of Kenilworth	SP3044873631	10 May 2013, 31 May 2013	Sweeping, beating and spot sampling	CFA18	Within land required
030-IT-144001	Brockendon Grange Farm including Broadwells Wood, between Kenilworth and Burton Green	SP2805975245	10 May 2013, 31 May 2013	Sweeping, grubbing and spot sampling	CFA18	Within land required
030-IT-146001	Black Waste Wood, Burton Green	SP2722675995	18 July 2012, 14 October 2012, 17 May 2013	Sweeping and grubbing	CFA18	Within land required
030-IT-164001	Coleshill Sewage Treatment Works, adjacent to the River Tame	SP1925691512	20 August 2012, 06 June 2013	Incidental recording	CFA19	Within land required
030-IT-170001	Middleton Hall Farm Quarry, east of Middleton	SP1883697451	14 June 2012, 07 July 2012, 06 August 2012	Sweeping and whole site sampling	CFA20	Within land required
030-IT-174001	Hill Farm, north-west of Drayton Bassett	SK1754801009	08 May 2013, 31 May 2013	Sweeping, beating and spot sampling	CFA21	Within land required
030-IT-176002	Home Farm, on the southern side of the village of Hints	SK1561802712	07 May 2013, 22 May 2013	Sweeping, grubbing, beating and bark	CFA21	Within land required

[10] Hereafter the term 'land required' is used as a shortened version of the full term 'land required for the construction of the Proposed Scheme'.

Ecology survey code	Survey site/location	OS Grid centroid	Survey dates	Survey type	CFA	Distance from the land required for construction of the Proposed Scheme[10] (m)
030-IT-177001	Brockhurst Lane (known locally as Rookery lane), on the eastern side of the village of Hints	SK1547703031	08 May 2013, 22 May 2013	Sweeping, beating, sieving and pond dipping	CFA21	Within land required
030-IT-178001	Flat's Lane, immediately to the north of the A5 at Weeford	SK1456105513	08 May 2013, 31 May 2013	Sweeping, beating and spot sampling	CFA21	Within land required
030-IT-179001	Packington Moor Farm, between the A5 at Weeford and Whittington Heath Farm	SK1496105549	08 May 2013, 02 June 2013	Sweeping and beating	CFA21	Within land required
030-IT-182001.	Whittington Heath Golf Course, south-east of Lichfield along the A51	SK1470707641	24 May 2012, 11 July 2012, 24 July 2012	Sweeping and spot sampling	CFA22	Within land required
030-IT-186001	Fradley Business Park South, adjacent to the A38	SK1431511908	22 May 2012, 07 July 2012, 06 August 2012	Sweeping, grubbing and spot sampling	CFA22	Within land required
030-IT-187001	Fradley Wood, located north of Wood End Lane and adjacent to the Trent and Mersey Canal	SK1357713442	05 November 2012, 14 May 2013, 02 June 2013	Sweeping	CFA22	Within land required
030-IT-189001	Ravenshaw Wood, between Wood End Lane and the Trent and Mersey Canal	SK1236513706	06 June 2012, 16 October 2012, 16 May 2013	Sweeping, incidental recording	CFA22	Within land required
030-IT-189003	Black Slough Wood, contiguous with Ravenshaw Wood, to the east of the A515 near Hanch	SK1176914052	11 July 2012, 14 October 2012, 16 May 2013	Sweeping, grubbing and incidental records	CFA22	Within land required

Table 4: Protected and/or notable invertebrate species identified during terrestrial surveys in CFA16 to CFA22 inclusive

Ecology survey code	Latin name	Status	Survey site/ location	OS Grid reference	Habitat	Survey date	CFA
030-IT-122001	*Bombus ruderatus*	Species of principal importance	Ladbroke Hill Farm	SP42535905	Arable field margin	17 July 2012	CFA16
030-IT-122001	*Metrioptera roeseli**	Nationally Scarce B	Ladbroke Hill Farm	SP42535905	Grassy field margin	17 July 2012	CFA16

Ecology survey code	Latin name	Status	Survey site/ location	OS Grid reference	Habitat	Survey date	CFA
030-IT-127001	*Anaglyptus mysticus*	Nationally Scarce B	Long Itchington and Ufton Woods SSSI	SP38946285	Scrub	09 July 2013	CFA16
030-IT-127001	*Brachyopa bicolor*	Red Data Book 2	Long Itchington and Ufton Woods SSSI	SP38736269	Woodland field layer	07 May 2013	CFA16
030-IT-127001	*Choerades marginata*	Nationally Scarce	Long Itchington and Ufton Woods SSSI	SP38946285	Woodland ride	09 July 2013	CFA16
030-IT-127001	*Limenitis camilla*	Species of principal importance	Long Itchington and Ufton Woods SSSI	SP38946285	Woodland ride	09 July 2013	CFA16
030-IT-127001	*Oxycera analis*	Red Data Book 2	Long Itchington and Ufton Woods SSSI	SP38706269	Woodland seepage along track	09 July 2013	CFA16
030-IT-135001	*Lasius brunneus*	Nationally Scarce A	South Cubbington Wood	SP35026887	Woodland	06 July 2013	CFA17
030-IT-138001	*Beris clavipes*	Nationally Scarce	Stoneleigh Park	SP32787168	River side vegetation	30 July 2012	CFA18
030-IT-138001	*Lasius brunneus*	Nationally Scarce A	Stoneleigh Park	SP33217066	Standing deadwood	21 May 2013	CFA18
030-IT-138001	*Metrioptera roeselii**	Nationally Scarce B	Stoneleigh Park	SP33007105	Grassland	30 July 2012	CFA18
030-IT-138001	*Uleiota planatus*	Nationally Scarce A	Stoneleigh Park	SP33107130	Deadwood	21 May 2013	CFA18
030-IT-144001	*Ctenophora pectinicornis*	Nationally Scarce	Brockendon Grange Farm	SP27847510	On trees	31 May 2013	CFA18
030-IT-144001	*Lasius brunneus*	Nationally Scarce A	Brockendon Grange Farm	SP27987510	Woodland edge	31 May 2013	CFA18
030-IT-164001	*Conocephalus discolor**	Nationally Scarce A	Coleshill Sewage Treatment Works	SP193915	Open habitat	20 August 2012	CFA19
030-IT-164001	*Metrioptera roeselii**	Nationally Scarce B	Coleshill Sewage Treatment Works	SP193915	Open habitat	20 August 2012	CFA19
030-IT-170001	*Arachnospila wesmaeli*	Red Data Book 3	Middleton Hall Farm Quarry	SP18789735	Bare ground	14 June 2012	CFA20
030-IT-170001	*Coenonympha pamphilus*	Species of principal importance	Middleton Hall Farm Quarry	SP18879753	Short turf and bare ground	14 June 2012	CFA20
030-IT-170001	*Lasioglossum malachurum**	Nationally Scarce	Middleton Hall Farm Quarry	SP18789735	Bare ground	06 August 2012	CFA20

Ecology survey code	Latin name	Status	Survey site/ location	OS Grid reference	Habitat	Survey date	CFA
030-IT-170001	*Tyria jacobaeae*	Species of principal importance	Middleton Hall Farm Quarry	SP18879753	Grassland	06 August 2012	CFA20
030-IT-176001	*Brachyopa insensilis*	Nationally Scarce	Roundhill Wood	SK15820233	At sap run on a tree	24 May 2012	CFA21
030-IT-176002	*Anthribus fasciatus*	Nationally Scarce A	Home Farm	SK15490258	Isolated trees	22 May 2013	CFA21
030-IT-176002	*Ctesias serra*	Nationally Scarce B	Home Farm	SK15490258	Isolated trees	22 May 2013	CFA21
030-IT-177001	*Nemoura dubitans*	Nationally Scarce B	Brockhurst Lane (known locally as Rookery lane)	SK15500301	Marshy grassland	22 May 2013	CFA21
030-IT-177001	*Orthonevra brevicornis*	Nationally Scarce	Brockhurst Lane (known locally as Rookery lane)	sk15530297	Marshy grassland	08 May 2013	CFA21
030-IT-179001	*Nomada lathburiana*	Red Data Book 2	Packington Moor Farm	SK15030553	Sandy track	08 May 2013	CFA21
030-IT-182001	*Epistrophe diaphana**	Nationally Scarce	Whittington Heath Golf Course	SK147076	Scrub fringe	24 July 2012	CFA22
030-IT-182001	*Nomada flavopicta*	Nationally Scarce	Whittington Heath Golf Course	SK147076	Open mosaic sward	24 July 2012	CFA22
030-IT-182001	*Nomada lathburiana**	Red Data Book 2	Whittington Heath Golf Course	SK147076	Along tracks within golf course	24 May 2012	CFA22
030-IT-186001	*Bombus rupestris*	Nationally Scarce	Fradley Business Park South	SK143118	On flowers in grassland/ ruderal mosaic	22 May 2012	CFA22
030-IT-186001	*Coenonympha pamphilus*	Species of principal importance	Fradley Business Park South	SK143118	Grassland	07 July 2013	CFA22
030-IT-186001	*Dolichovespula media**	Red Data Book 3	Fradley Business Park South	SK143118	On bramble	22 May 2012	CFA22
030-IT-186001	*Lasioglossum malachurum**	Nationally Scarce	Fradley Business Park South	SK143118	Bare ground	22 May 2012	CFA22
030-IT-186001	*Stelis ornatula*	Red Data Book 3	Fradley Business Park South	SK143118	Bare ground	07 July 2012	CFA22
030-IT-186001	*Tyria jacobaeae*	Species of principal importance	Fradley Business Park South	SK143118	Grassland	06 August 2012	CFA22
030-IT-189001	*Euthia schaumi*	Nationally Scarce B	Ravenshaw Wood	SK124134	Swept from trees in woodland	16 May 2013	CFA22

Ecology survey code	Latin name	Status	Survey site/ location	OS Grid reference	Habitat	Survey date	CFA
030-IT-189002	*Malthinus frontalis*	Nationally Scarce	Black Slough Farm	SK121137	Swept from trees on edges of woodland	11 June 2012	CFA22
030-IT-190001	*Pocota personata*	Red Data Book 2	Black Slough (north of Lichfield Road)	SK10791438	At rot hole in ash tree within woodland	10 June 2012	CFA22
030-IT-190002	*Dipogon bifasciatus*	Red Data Book 3	Shaw Lane	SK103144	On tree trunk	26 June 2012	CFA22

* These species highlighted may be more common now than their status suggests. This is largely due to range expansions over the past 10-15 years. Some species, such as *Nomada lathburiana* and *Dolichovespula media*, are likely to be downgraded during upcoming reviews of status.

CFA16 Ladbroke and Southam

Desk study

2.4.2 Species noted from Warwickshire Biological Record Centre dataset and from a report by Falk (2006)[11] within 2km of the Proposed Scheme, and which have potential habitat within the Proposed Scheme include *Bombus humilis* and *Bombus ruderatus* (bumblebees), which are species of principal importance and priority species identified in the Warwickshire, Coventry and Solihull Local Biodiversity Action Plan (LBAP). Suitable foraging habitat is present along trefoil-rich arable margins within land required for construction of the Proposed Scheme.

2.4.3 There are also records of white-letter hairstreak butterfly (*Satyrium w-album*) and white admiral butterfly (*Lamenitis camilla*), both species of principal importance. There are a number of designated sites which mention invertebrates within their citations. Southam Quarry LWS (2.8km north-east of land required for construction of the Proposed Scheme) has a provisional species total of 112 bees and wasps, making it one of the richest aculeate sites in the West Midlands (Falk, 2006). Species of principal importance at the site include: grizzled skipper, dingy skipper, small blue, chalk carpet moth, *Bombus humilis* and *Bombus ruderatus*; all but the grizzled skipper are also priority species identified within the Warwickshire, Coventry and Solihull LBAP. The species present at the site are those associated with the Lias strata, the same as that found in the vicinity of Long Itchington and Ufton Woods, and therefore of a calcicolous nature. Long Itchington and Ufton Woods SSSI is noted for its oak-hazel coppice and as an important site in Warwickshire for invertebrates including butterflies and calcareous seepage soldierflies[12,13].

2.4.4 Ufton Fields SSSI, over 500m west of the land required for construction of the Proposed Scheme, has grizzled skipper and dingy skipper mentioned on the citation. Small blue has been extinct at the site since 1995. The site also has records of the Nationally Scarce soldierfly *Stratiomys singularior*. Ufton Fields SSSI is managed by Warwickshire Wildlife Trust and has some good wildlife margins. However scrub is

[11] Falk, Steven (2006), The modern bee and wasp assemblages (*Hymenoptera aculeate*) of Warwickshire's calcareous quarries and spoilheaps, and the conservation issues facing them; *British journal of entomology and natural history*; Dorchester.
[12] Natural England; Ufton Wood SSSI citation; http://www.sssi.naturalengland.org.uk/citation/citation_photo/1002035.pdf; Accessed 02 October 2012.
[13] Warwickshire County recorder – bees and wasps and flies; Personal communication.

encroaching into the SSSI due to lack of funds for appropriate management and it is becoming less suitable for terrestrial invertebrates.

2.4.5 Bishop's Hill and Bishop's Bowl LWS, just over 1.9km east of the land required for construction of the Proposed Scheme at Bishops Itchington, contains short sward calcareous grassland and has one of the most diverse bee and wasp resources in the West Midlands with a total of 128 species[14]. Bishop's Hill and Bishop's Bowl LWS is linked along an existing railway to Harbury Railway Cutting SSSI which is within 2km of the land required for construction of the Proposed Scheme, and is noted as a rich area of calcareous grassland with spoil banks identified for butterflies.

2.4.6 Anecdotal information obtained from local recorders during a meeting with Warwickshire Wildlife Trust and Warwickshire County Council identified dingy and grizzled skipper using the Oxford Canal corridor and grizzled skipper using calcareous grassland habitats at Ufton Hill west of the land required for construction of the Proposed Scheme.

Survey data

2.4.7 The habitat within the area is predominantly intensive farmland; the broad landscape was assessed as poor for terrestrial invertebrates and homogenous with little variation in features. The exception was habitats around Long Itchington and Ufton Wood SSSI which are on calcareous geology and at Ladbroke Hill Farm where there were some species-rich arable field margins.

2.4.8 Three sites were surveyed in CFA16 but detailed surveys were only carried out on two of these.

2.4.9 Long Itchington and Ufton Woods SSSI (030-IT-127001) included former hazel coppice and tall standard oak and ash trees with good spring blossom amongst the shrub layer and rides provided by sallows, blackthorn and hawthorn. The canopy generally lacks variation. However a past coppicing regime and the presence of woodland rides increases site heterogeneity, thus encouraging a diverse invertebrate assemblage. The eastern and southern rides are characterised by plentiful flowers including violets and ground ivy and towards the west of the site, the rides have a damp character with water filled ditches. The woodland was noted as being of conservation interest for woodland invertebrates with five nationally notable species recorded during two visits in 2013: white admiral butterfly *Limenitis camilla* (a species of principal importance), a saproxylic hoverfly *Brachyopa bicolor* (RDB 2), a calcareous woodland seepage soldierfly *Oxycera analis* (RDB 2), a deadwood robberfly *Choerades marginata* (NS) and a deadwood longhorn beetle *Anaglyptus mysticus* (NS B). Deadwood is limited within the woodland; however, the presence of *Brachyopa bicolor* suggests that there could be a highly specific saproxylic invertebrate assemblage within the woodland.

2.4.10 Ladbroke Hill Farm (030-IT-120001) was characteristic of the farmland in the area, consisting of arable fields with varying quality margins and pockets of small woodland. The arable margins at Ladbroke Hill Farm contained red clover and other Fabaceae, which are plants of importance to bumblebees, including *Bombus ruderatus*

[14] Falk, Steven (2006), The modern bee and wasp assemblages (Hymenoptera: aculeata) of Warwickshire's calcareous quarries and spoilheaps, and the conservation issues facing them; *British journal of entomology and natural history*; Dorchester.

of which a number of individuals were recorded during the survey in July 2012. These arable margins were a key feature of the site for invertebrates. Some of the other arable margins in the area could be of some potential to these scarce bumblebees, providing a nectar and pollen foraging resource.

2.4.11 Numerous other nectar and pollen feeding invertebrates were recorded during the survey; although no nationally notable species were recorded. A population of grassland butterflies were noted including the marbled white (*Melanargia galathea*), a nationally local[15] species most frequently recorded from calcareous grasslands.

2.4.12 The woodland at Ladbroke Hill Farm (Windmill Hill Spinney) was small and dense with a few open canopy areas. The woodland invertebrate fauna diversity was consequently found to be small and represented only by a few common woodland species, as highlighted by ISIS analysis.

CFA17 Offchurch and Cubbington

Desk study

2.4.13 The citation for South Cubbington Wood LWS mentions the presence of several locally rare species, most notably white admiral butterfly, a species of principal importance and purple hairstreak butterfly (*Favonius quercus*).The white letter hairstreak butterfly, another species of principal importance, has also been recorded from the woodland according to data from Warwickshire Biological Records Centre. Habitat which has potential to support white letter hairstreak may also be present in the form of standard elm trees along boundary features such as hedgerows within land required for the Proposed Scheme. Anecdotal information obtained from local recorders during a meeting with Warwickshire Wildlife Trust and Warwickshire County Council identified South Cubbington Wood as in need of management to improve the habitat for butterflies. The farmland around South Cubbington Wood is in Higher Level Stewardship (HLS) and wildflower planting on field edges has been carried out to improve the habitat for invertebrates.

2.4.14 Ryton Wood SSSI is over 3.8km east of land required for the Proposed Scheme. However, Ryton Wood is part of the Princethorpe Woods complex of ancient woodlands which extends to South Cubbington Wood within land required for the Proposed Scheme. Ryton Wood is important to invertebrates including white admiral and wood white (species of principal importance and Warwickshire BAP priority species). The Princethorpe Woods complex is part of a large area scheme to safeguard native wildlife in Warwickshire, including their rich woodland butterfly fauna[16, 17].

2.4.15 Anecdotal information obtained from local recorders during a meeting with Warwickshire Wildlife Trust and Warwickshire County Council identified remnant calcareous grassland along Ridgeway Lane (a track along which the Centenary Way long distance footpath runs) between Print Wood and the Grand Union Canal which is an important corridor for white letter hairstreak. Land near Snowford Farm, at the

[15] A nationally local species can have a wide distribution but is localised to specific locations due to particular constraints such as the local geology, flora or temperature regimes. In the case of the marbled white the primary factors which affect its distribution is geology and probably temperature.
[16] Slater, M. and Warmington, K. (2011). *The butterfly landscape areas of Warwickshire*. Unpublished (Butterfly Conservation).
[17] Warwickshire Wildlife Trust; The butterfly landscape areas of Warwickshire; www.warwickshire-wildlife-trust.org.uk/conservation/living-landscapes/princethorpe-woodlands-scheme.aspx; Accessed: 12 September 2012.

northern end of this track, is under HLS and has undergone improvements for butterflies. Scrub management along the Offchurch Greenway, east of the Proposed Scheme, has also been carried out by Sustrans to benefit terrestrial invertebrates such as butterflies.

Survey data

2.4.16 The Offchurch and Cubbington study area was noted for its complex of small to medium-sized woodlands with populations of species of principal importance and scarce butterflies. The woodlands may also be home to other high fidelity species including saproxylic flies and beetles. Other than the woodlands, the landscape is largely homogenous and farmed and of limited interest for terrestrial invertebrate assemblages.

2.4.17 Only one site was surveyed within the study area: South Cubbington Wood (030-IT-135001). No notable species of interest were found.

2.4.18 The part of South Cubbington Wood available for survey was of poor quality for invertebrates. The woodland was dense with little space for trees to mature successfully and produce an extensive crown. The trees are tall and thin being forced upwards by the heavy shading. The shrub layer is extensive with common hawthorn and other shrubs but the dense shading and crowding is not conducive to plant or invertebrate species diversity. The site lacks a deadwood resource and therefore had a poor fungal representation, a key component of woodlands for autumnal fungus gnats and craneflies. The ground flora was found to be sparse, reducing humidity that is another key component of woodland interiors to support diverse invertebrate assemblages. No ISIS analysis was undertaken due to the poor species results from the survey.

CFA18 Stoneleigh, Kenilworth and Burton Green

Desk study

2.4.19 No records of species of principal importance butterflies have been recorded in the area within 5km of the land required for construction of the Proposed Scheme.

2.4.20 Ryton Wood SSSI is approximately 3.8km east of the land required for construction of the Proposed Scheme (within CFA17 Offchurch and Cubbington) but within range of some terrestrial invertebrates within this area.

2.4.21 Anecdotal information obtained from local recorders during a meeting with Warwickshire Wildlife Trust and Warwickshire County Council identified Crackley Wood LNR as a target woodland for white admiral butterfly

Survey data

2.4.22 The dominant habitat of interest to terrestrial invertebrates within the study area was woodland. Woodlands in the area are largely fragmented but there were still some large trees in the landscape and many woodlands in proximity to one another. The wider land use is farmland, predominantly pastoral with some arable. The fragmentation of the woodlands has impoverished the woodland invertebrate fauna, with large amounts of edge habitat. This appears to have reduced the extent and diversity of intrinsic and important invertebrate assemblages, and the homogenous

habitat structure was only found to support generalist woodland species, with a lack of high fidelity species recorded.

2.4.23 There have been six sites surveyed within the area. Five of the sites surveyed were woodland sites or sites with woodland components of varying features from small, poor quality woodland with little deadwood or structure to more heterogynous woodlands and parkland trees. The sixth site was Milburn Grange Farm which represented a wider landscape site with typical farmland habitats. Only four of the sites had more detailed surveys carried out.

2.4.24 Stoneleigh Park (030-IT-138001) is a large area of land incorporating parkland, industrial and hard standing areas, species-poor grassland, arable and a small area of brownfield habitat. The main features of interest were a number of large veteran oak trees. The most important trees are those that contain features of specific interest to high fidelity flies and beetles. Some of the trees exhibit sap runs. The ISIS analysis highlighted the BAT F2 (grassland and scrub matrix) as being of some importance. In terms of SAT, ISIS highlighted nine species of fidelity to saproxylic features. It is likely that these assemblages are more developed than the survey findings suggest. Due to poor weather during 2012 and 2013, only sustained survey would yield a longer list of saproxylic species. However, it is thought that the lack of flower foraging and deadwood fallen from trees is likely to inhibit the site from being of regional interest to invertebrates. Notable species recorded within Stoneleigh Park are:

- *Beris clavipes*, a Nationally Scarce soldierfly associated with ponds and seepages. The fly was recorded along the River Avon;
- *Lasius brunneus,* a Nationally Scarce ant; and
- *Uleiota planatus*, a Nationally Scarce deadwood beetle.

2.4.25 At Milburn Grange Farm (030-IT-141001), all species recorded were common and widespread. This agricultural farmland site is intensively managed with limited invertebrate interest.

2.4.26 Much of the survey site at Brockendon Grange Farm (030-IT-144001) contained farmland with typical field boundaries of the area, namely moderately poor hedgerows that along some stretches have a more diverse mix of woody plant species including rose, elderberry and holly. The open farmland produced no notable species or assemblages of importance. Of greatest asset to the field boundaries are the spring flowering scrub species such as blackthorn and common hawthorn. The boundaries provide corridors between the woodlands in the area including Blackwaste Wood, Broadwells Wood, Crackley Wood and Roughknowles wood. This landscape linkage is of primary importance in permitting species movement and subsequent colonisation of new areas or increasing the robustness of populations on the landscape scale. Broadwells Wood, which was surveyed as part of the same site, was of moderate quality but lacks diverse structure, and therefore displays a limited woodland invertebrate fauna. Notable species recorded at Broadwells Wood were *Ctenophora pectincornis*, a Nationally Scarce deadwood cranefly, and *Lasius brunneus*, a Nationally Scarce ant.

2.4.27 The majority of the species from Black Waste Wood (030-IT-146001) were 'common' or 'local' to woodlands (as defined by Recorder 3), indicating that the site has been at least partially degraded, possibly through habitat fragmentation which has resulted in the loss of key features.

CFA19 Coleshill Junction

Desk study

2.4.28 There was no relevant data available within the study area.

2.4.29 Anecdotal information obtained from local recorders during a meeting with Warwickshire Wildlife Trust and Warwickshire County Council identified that there were habitat creation opportunities in the Tame Valley corridor for dingy skipper identified as part of the River Tame Living Landscape Scheme.

Survey data

2.4.30 The majority of habitat within land required for the Proposed Scheme in the Coleshill Junction area is arable land and improved pasture which is of less interest for notable invertebrates with few features of interest and heterogeneity.

2.4.31 There have been two sites sampled within the area, but a detailed survey was only carried out at Coleshill Sewage Treatment Works.

2.4.32 Coleshill Sewage Treatment Works (030-IT-164001) is predominantly in a mid stage state of succession with many areas past their optimum for open habitat invertebrates. For example, wet mire or mineral marsh assemblages are still present at the site but appear to be in decline. The site is dominated by scrub and ruderals with small areas of short perennial vegetation along some of the trackways. These trackways possess some features of early succession though these are limited. Surveys recorded two nationally scarce species: the long-winged conehead *Conocephalus discolor* and Roesels's bush-cricket *Metrioptera roeselii*. However, these species are likely to be more common now than their status suggests due to range expansions over the past 10-15 years. The presence of bird's-foot trefoil and creeping cinquefoil warranted a further visit to assess the presence of two species of principal importance associated with these plants: dingy skipper and grizzled skipper. A targeted visit for these species was carried out in June 2013 and concluded that there was insufficient habitat to support these species at the site.

CFA20 Curdworth to Middleton

Desk study

2.4.33 Consultation of various invertebrate atlases, specifically the BWARS provisional atlas series (1-8), showed a lack of key species indicators of habitat quality within the study area. This is likely to be partly due to a lack of recording effort, along with the homogenous landscapes and habitats. This BWARS dataset was used for the Curdworth to Middleton area as the site at Middleton Hall Farm Quarry was considered of possible importance to this group of invertebrates.

2.4.34 Anecdotal information obtained from local recorders during a meeting with Warwickshire Wildlife Trust and Warwickshire County Council identified dingy skipper within habitats at Middleton Hall Farm Quarry and the adjacent Middleton Hall Estate.

Staffordshire Ecological Record listed the species of principal importance dingy skipper from Tameside Nature Reserve at OS grid reference SK20830254, 5.5km north of the Middleton Hall Farm Quarry (terrestrial invertebrate survey site 300-IT-170001) and 3.6km from the land required for construction of the Proposed Scheme[18]. It is unclear how far dingy skipper will disperse (it is likely to depend upon wider countryside use between viable sites) but anecdotally up to 10 km has been suggested and these sites are likely to be within range of habitats within land required for the Proposed Scheme, which could support this species.

2.4.35 Several records were also noted of the species of principal importance small heath (*Coenonympha pamphilus*) at numerous local sites including Tameside Nature Reserve at Tamworth (OS grid reference SK208025). These records are located 4.2km north-east of the area land required for the construction of the Proposed Scheme and fall within CFA21 Drayton Bassett, Hints and Weeford; they are included here as suitable habitats within the land required for construction of the Proposed Scheme within CFA20 Curdworth to Middleton could fall within their dispersal range. There are also records at Middleton Lakes RSPB Reserve 2km east of the land required for the construction of the Proposed Scheme (OS grid reference: SP201998). The habitats within Middleton Hall Farm Quarry are also considered suitable to support this species.

2.4.36 There were several records of wall butterfly (*Lasiommata megera*), a species of principal importance, at Middleton Lakes RSPB Reserve, and white-letter hairstreak, a species of principal importance, had been recorded from Kingsbury Water Park (OS grid reference: SP205965) 3.6km east of the land required for the construction of the Proposed Scheme. There is habitat within land required for the Proposed Scheme which could support the wall butterfly along with elm trees that may be suitable to support white-letter hairstreak.

2.4.37 There are numerous records of common and local species of solitary bees and wasps that are identified as a priority species group (ground nesting solitary bees and wasps) under the Staffordshire LBAP. There is habitat within land required for the Proposed Scheme which could support this species group.

Survey data

2.4.38 There have been two sites sampled within the area, but a detailed survey was only carried out at Middleton Hall Farm Quarry (030-IT-170001). The quarry includes bare and sparsely vegetated bunds and flower-rich foraging habitat for invertebrates. The ISIS results indicate two BAT; unshaded early successional mosaic (F1) and grassland and scrub matrix (F2) along with wetland-associated assemblages due to ephemeral water bodies present on the site at the time of surveying. The ISIS analysis did not note any SAT of importance, although the poor weather of 2012 may be a factor. The SAT represented are only highlighted by one or two indicator species including bare sand and chalk (F111) and also open short sward (F112). These are the two SAT of potential at this site and despite their very low score in ISIS it is thought that these are of importance for invertebrates. Notable species recorded from the site include:

[18] The northern boundary of the Curdworth to Middleton area (CFA20) is at the Warwickshire – Staffordshire border so records close to the county boundary from Staffordshire Ecological Record were useful data for the northern part of this area.

- *Arachnospila wesmaeli,* a spider-hunter wasp (Red Data Book 3);
- small heath, a species of principal importance;
- *Lasioglossum malachurum*, a Nationally Scarce mining bee; and
- *Tyria jacobaeae* cinnabar, a species of principal importance.

2.4.39 Given the poor weather conditions for invertebrates in the 2012/13 survey season, it is possible that the site usually supports a higher number of notable species and the habitats present suggest that there could be more than five nationally notable species present. However, it was not thought that more than ten species would be recorded given the quality of features present.

2.4.40 Solitary bees and wasps were present at Middleton Hall Farm Quarry and are an important assemblage; the adjacent county of Staffordshire (1.3km from the quarry) have recognised this important group by including ground-nesting bees and wasps as a priority species group in the Staffordshire LBAP.

CFA21 Drayton Bassett, Hints and Weeford

Desk study

2.4.41 A number of records of the species of principal importance, the white-letter hairstreak, were noted within 2km of land required for the Proposed Scheme in the Drayton Bassett, Hints and Weeford study area. This species is associated with elm trees. There is potentially suitable habitat for this species within land required for the Proposed Scheme.

2.4.42 Although no records occur locally, purple hairstreak (*Neozephyrus quercus*) is probably localised around mature oak woodlands in the area. This assumption is based on the species being largely a high canopy dwelling species of oak woodlands that seldom comes down to the ground and is likely to be under recorded. Nationally it is a species that is expanding its range, especially in the Midlands[19]. Although not a species of principal importance, it is of interest due to its high fidelity to oak trees.

2.4.43 There is a record of small heath (*Coenonympha pamphilus*), a species of principal importance, from Hints, although there is minimal suitable habitat for this species within land required for the Proposed Scheme.

Survey data

2.4.44 The Drayton Bassett, Hints and Weeford study area possesses two broad landscape character types. The majority of the study area is dominated by arable farmland but a small area to the south of Hints has an undulating, pastoral character with fragmented woodlands, some of which are hilltop woodlands. The presence of the hilltop woodlands, including Roundhill Wood, may be of potential interest to some invertebrates that are known to congregate at such features.

2.4.45 There have been six sites surveyed within the area, of which five have had detailed invertebrate survey. Most species recorded were common and widespread.

[19] Butterfly Conservation; *Purple hairstreak*. http://butterfly-conservation.org/Butterfly/32/Butterfly.html?ButterflyId=42. Accessed: 02 October 2012.

2.4.46 Although *Brachyopa insensilis*, a Nationally Scarce saproxylic hoverfly, was recorded from Roundhill Wood (030-IT-176001), in general the woodland was not considered to be of interest to invertebrate assemblages due to its small, isolated nature and being dominated by plantation woodland with introduced shrubs (rhododendron). *Brachyopa insensilis* is a sap run fidelity species and was recorded at a weeping sycamore tree in the woodland. Normal tree species for this fly include elms and beech. It is likely that the hoverfly (of which a few were noted at the sap run) are able to move through the landscape as there are very few features that could sustain an established sap run assemblage at this site. This woodland may have been attractive to the flies as well due to it being hilltop woodland, therefore a prominent feature in the landscape.

2.4.47 The majority of the land at Hill Farm (030-IT-174001) is represented by habitats grazed by sheep and the boundary trees largely lack any invertebrate interest as they have little rot or deadwood. Sedge swamp which is present adjacent to the Black-Bourne Brook is a productive *Diptera* (fly) habitat but due to its uniform character lacks notable invertebrate diversity. The wetland habitat may be more productive in years with more optimal weather. The dance fly *Rhamphomyia laevipes* occurs whose distribution is currently not well known but is classed as a local species in Recorder3. The nut weevil *Curculio nucum* is a local species found under a mature oak near the pond. This agricultural farmland site is intensively managed with limited invertebrate interest.

2.4.48 The Brockhurst Lane (known locally as Rookery lane) site (030-IT-177001) was small but is of relatively high habitat diversity, particularly for *Diptera*. The high water table gives rise to a stable environment for wetland species to proliferate and the location of the site within a valley surrounded by trees provides a sheltered environment. There is good structural habitat variation with marsh and open water, tall bulrush stands and adjacent alder carr. Despite the cold spring and small size of the site, two notable species were recorded: *Nemoura dubitans* a Nationally Scarce B stonefly, and *Orthonevra brevicornis*, a Nationally Scarce wetland hoverfly. The BAT W3 in the ISIS analysis is of some importance complemented to a lesser degree by the W2 broad assemblage.

2.4.49 Most species recorded at Flat's Lane (030-IT-178001) were common and widespread. The dance fly *Rhamphomyia laevipes* occurs along with local picture-winged fly *Tephritis conura,* a mostly northern species towards the edge of its southern range. The local hister beetle *Peranus bimaculatus* was swept from hedgerow vegetation. This agricultural farmland site is intensively managed with limited invertebrate interest as confirmed by the ISIS analysis.

2.4.50 The majority of the Packington Moor Farm site (030-IT-179001) arable fields. However there was some invertebrate interest within the margins and boundaries of the fields. The hedgerows are species-poor but contain standard oak trees with many old trees containing signs of senescence including heart rot, deadwood and rot holes, although no notable invertebrate species were found. These features, particularly where in aggregations, could be of some importance to saproxylic assemblages. The sandy nature of the soils also gives rise to suitable nesting situations for solitary bees and wasps (Staffordshire LBAP species group action plan). Although no notable species were recorded during these surveys, given the very poor weather patterns of 2013 this

assemblage could be of more interest than the survey findings suggest. However, it is not thought that highly notable species or assemblages are present due to a lack of rich arable field margins. *Nomada lathburiana*, a Red Data Book 2 bee was recorded from Packington Moor Farm, although this species is thought to be more common than the status suggests due to a range expansion over the last 10-15 years.

2.4.51 Home Farm (030-IT-176002) is primarily a sheep grazed improved pasture site, marked at its south-eastern perimeter by Roundhill Wood (IT-300-176001). Within the pasture are isolated trees including oak, horse-chestnut, sycamore and lime. Towards the site's northern boundary, it is bisected by the Black Brook with patches of sedge swamp and wet rush pasture. The majority of the land holding is represented by habitats grazed by sheep and the boundary trees largely lack any interest for invertebrates as they are mature, intact specimens with little rot or deadwood. The sedge swamp is a productive *Diptera* (fly) habitat but due to its uniform character lacks significant diversity. The wetland habitat may be more productive in years with more optimal conditions (2013 is noted as being extremely poor for invertebrates). Two notable species were recorded from the site: *Anthribus fasciatus*, a Nationally Scarce Category A fungus weevil, and *Ctesias serra*, a Nationally Scarce Category B cobweb beetle.

2.4.52 The majority of the species from the survey sites in this area were 'common' or 'local' (as defined by Recorder 3), indicating that the sites have been at least partially degraded and the wider landscape homogenised. The exceptions to the area include the wetland valley habitats at Hints where two wetland species were recorded, and the old trees that are sporadic through the landscape from which three saproxylic and old growth tree species were recorded. The open farmland produced no notable species or assemblages of interest.

CFA22 Whittington to Handsacre

Desk study

2.4.53 The area is known to support the nationally scarce saproxylic hoverfly *Xylota florum*, which is associated with coarse woody debris in wooded streams and wet woodland[20]. It was not recorded from the immediate area or surveyed sites but has been recorded from the wider Lichfield district (record only to SK11, from the Hoverfly Recording Scheme). Sub-optimal habitat has been identified within land required for the Proposed Scheme which could support this species.

2.4.54 Records from Staffordshire Ecological Record include two species of principal importance: wall butterfly and white-letter hairstreak at Fradley. Wall is associated with open, short turf habitats and is found on brownfield sites and the white-letter hairstreak is associated with the woodland resources of the area and any boundary elm trees that may be present within land required for the Proposed Scheme. No elm trees were identified within land required for the Proposed Scheme to support this species during survey.

[20] Stubbs, Alan; Falk, Steven (2002), British Hoverflies; British Entomological and Natural History Society. Dorchester.

Survey data

2.4.55 The majority of the habitat within land required for the Proposed Scheme is unlikely to support invertebrate populations of interest. Many of the broad habitat types are not in good condition and some invertebrate assemblages are very poorly represented despite adequate sampling. The woodlands are degraded, predominantly through non-native planting and homogenisation of the canopy through wholesale tree clearance and replanting.

2.4.56 A total of nine sites were surveyed within the study area of which five have had detailed survey. The sites sampled ranged from brownfield and arable margins to broad-leaved woodland and parkland trees.

2.4.57 Although *Dipogon bifasciatus*, a Red Data Book 3 spider-hunting wasp, was recorded from Shaw Lane (030-IT-190002), the site was not considered to be of importance for invertebrate assemblages due to the presence of small woodlands, a domination of Himalayan balsam in the woodland inhibiting the native flora.

2.4.58 The survey site at Black Slough Farm (030-IT-189002) comprised a series of poor pasture fields and hedgerows with mature trees, some of which exhibit small levels of decay but generally there was a lack of deadwood features. *Malthinus frontalis*, a Nationally Scarce soldier beetle, was recorded from the site which has not been recorded in Staffordshire for 10 years. However, there are numerous records for the past 20 years indicating a lack of recent recording.

2.4.59 Whittington Heath Golf Course (030-IT-182001) contains open habitats with bare ground, short turf and flower foraging, features of high quality for terrestrial invertebrates including solitary bees and wasps. However, the golf course is intensively managed with few lowland heathland features left and subsequently has an impoverished open, bare ground and lowland heath invertebrate assemblage. Only 10 species from the site were shown in the ISIS assessment as having fidelity to bare ground. However it does possess some species of interest. In particular the presence of *Melitta leporina* and its special parasite *Nomada flavopicta*, a Nationally Scarce nomad bee, of which there is only one other known population in Staffordshire (Highgate Common SSSI) and no extant records for Warwickshire[21]. It is thought that the bare sand and chalk assemblage is stronger than the ISIS scores suggest and sampling in a year with better weather would confirm this. Nevertheless, sufficient information has been gathered to assess the overall assemblage and species composition.

2.4.60 Fradley Business Park South (030-IT-186001) is small and much of the site is relatively poor for high fidelity invertebrate species and groups being primarily poor semi-improved grass and scrub fringe with a few standard trees. It is a resource for common and local invertebrates but there are viable populations of the species of principal importance small heath butterfly and cinnabar moth. The grassland is species poor but does have good abundances of common flowering plants such as ragwort and yellow composites, which are an important resource for nectar and pollen feeding invertebrates. The site contains some open habitats with bare ground, short turf and

[21] Warwickshire County recorder – bees and wasps and flies; Personal communication, 2012.

flower foraging on earth bunds, features of high quality for terrestrial invertebrates including solitary bees and wasps. The BAT 'unshaded early successional mosaic' and 'grassland and scrub matrix' from ISIS analysis of species collected from these habitats indicate a good presence of high fidelity species. Notable species from the site were: small heath, a species of principal importance, *Stelis ornatula*, a Red Data Book 3 cuckoo bee, and cinnabar, a species of principal importance.

2.4.61 There was a mix of woodland and grassland at Fradley Wood (030-IT-187001). The woodland compartment at Fradley Wood was structurally diverse but densely shaded and crowded. There was some limited deadwood but the canopy was populated by young to mature trees reducing the potential for saproxylic communities to develop. The field layer is sporadic and dominated by common woodland flora such as ferns and bramble. The invertebrate assemblage is represented by common woodland species, as highlighted by the lack of SAT in the ISIS analysis. The grassland is likely to be of higher quality to invertebrates than the results suggest. The cold start to 2013 will have inhibited some species that would be expected at a damp and flower rich site such as this.

2.4.62 Ravenshaw Wood (030-IT-189001) is largely replanted though there are some mature oak trees amongst the rhododendron and birch. The ground flora was largely poor with dominant stands of bracken though there are some richer areas with male fern. Key invertebrate fauna associated with woodlands appears to be largely lacking at this site, as noted by the ISIS analysis. The findings did include representative species of the arboreal canopy and shaded field and ground layer, although the species list showed poor diversity. This is largely due to the dominant cover by bracken and the poor structure to the shrub layer. ISIS highlighted the 'seepage' SAT W126 in the assessment. The woodland is low lying and there are numerous ditches running through it, including wetter areas towards the north of the woodland adjacent to the Trent and Mersey Canal. A Nationally Scarce Category B beetle, *Euthia schaumi*, was recorded within Ravenshaw Wood.

2.4.63 The ISIS results from Black Slough Wood (030-IT-189003), which is continuous with Ravenshaw Wood, highlight a number of BAT applicable to shaded habitats including 'shaded field layer' (the most prominent feature of the site) and 'wood decay', which was minimal. There are also a number of other BAT present, most notably associated with wetlands. This is due to the wet carr on the northern edge of the woodland and most interestingly the presence of a flowing water assemblage. The site is complex but each BAT is relatively species poor based on the ISIS assessment. Notable species recorded from Black Slough Wood were: *Pocota personata*, a saproxylic hoverfly (RDB2) and cinnabar, a species of principal importance.

2.4.64 Many of the sites surveyed supported at least one nationally scarce (RDB) species or are reasonably expected to support these species. Sites with old trees possessing some degree of senescence had saproxylic features such as rot holes and deadwood, which although scarce across the landscape appears to be sustaining a low density assemblage of deadwood-associated invertebrates. Black Slough Farm, Ravenshaw Wood (although most features are shaded or crowded out by other trees) and Black Slough all possess these features. Most of the notable species recorded across the sites are associated with either open mosaic swards or old trees. It is these two broad

assemblages that are greatest interest to terrestrial invertebrate assemblages in the study area.

3 Aquatic invertebrates

3.1 Introduction

3.1.1 This section of the appendix presents details of baseline information relating to aquatic invertebrates that is relevant to the section of the Proposed Scheme that will pass through CFA16 to 22 inclusive.

3.2 Methodology

3.2.1 Details of the standard methodology utilised for aquatic invertebrate survey are provided in Ecology technical note: Ecological field survey methods and standards (Volume5: Appendix CT-001-000/2).

3.2.2 Desk study records relating to aquatic invertebrates were obtained from Environment Agency routine aquatic invertebrate monitoring data.

3.2.3 For watercourse aquatic invertebrates the Community Conservation Index (CCI)[22] has been used to assess the conservation value of the assemblage. The CCI is a well established method of assessing the value of the aquatic invertebrate community which has been aligned to the evaluation criteria for the Proposed Scheme as shown in Table 5.

Table 5: Evaluation criteria for invertebrate assemblages

CCI	Description	CCI value	Value used for the assessment	Additional notes
0.0 to 5.0	Sites supporting only common species and/or a community of low taxon richness.	Low	Negligible to Local/parish	Local/parish if common species are indicative of good biological water quality.
>5.0 to 10.0	Sites supporting at least one species of restricted distribution and/or a community of moderate taxon richness.	Moderate	Local/parish	Community considered to enrich local area.
>10.0 to 15.0	Sites supporting at least one uncommon species, or several species of restricted distribution and/or a community of high taxon richness.	Fairly High	District/borough to County/ metropolitan	County value if several species of restricted distribution occur within a community of high taxon richness.
>15.0 to 20.0	Sites supporting several uncommon species, at least one of which may be nationally rare and/or a community of high taxon richness.	High	County/ metropolitan to Regional	Regional value if several uncommon species occur within a community of high taxon richness.
>20.0	Sites supporting several rarities, including species of national importance, or at least one extreme rarity (e.g. taxa included in the British RDBs) and/or a community of very high taxon richness.	Very High (potentially of national significance and may merit statutory protection)	National or International	International where site supports endangered/vulnerable or endemic Red Data Book species.

[22] Chadd, R.P. and Extence, C.A. (2004), The conservation of freshwater macroinvertebrate populations: a community-based classification scheme. Aquatic Conservation: Marine and Freshwater Ecosystems.14, 597–624.

3.2.4 A summary of locations at which aquatic invertebrate surveys were undertaken within the section of the Proposed Scheme that will pass through CFA16 to 22 inclusive is provided in Table 6, and shown in Volume 5: Map Books – Ecology, Maps EC-12.

3.2.5 To ensure consistency with Appendix EC-001-003 (sections 6 on River Habitat Survey and River Corridor Survey), the aquatic invertebrate survey locations reported here have been referenced by watercourse location as shown in the Volume 5: Map Books – Ecology, Maps EC-10.

Table 6: Summary of aquatic invertebrate survey locations for CFA16 to CFA22 inclusive

Ecology survey code	Watercourse	Feature type	Survey date(s)	CFA	Distance from the Proposed Scheme[23] (km)
030-IA1-119001	Unnamed tributary watercourse of the River Itchen	Ordinary watercourse	02 April 2013	CFA16	Site located 0.55km upstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-081; C6).
030-IA1-119002	River Itchen	Ordinary watercourse	03 April 2013	CFA16	Site located 2.0km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-082; I7).
030-IA1-126001	River Itchen	Ordinary watercourse	03 June 2013	CFA16	Site located 0.55km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-086; J5).
030-IA1-132001	Unnamed tributary watercourse of the River Leam	Ordinary watercourse	29 October 2012 and 02 April 2013	CFA17	Site located at the route crossing (Volume 5: Map Books – Ecology, Map EC-10-090; H7).
030-IA1-133001	Main river	River Leam	29 October 2012 and 02 April 2013	CFA17	Site located 0.16km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-090; H7).
030-IA1-139001	River Avon	Main river	30 April 2013	CFA18	Site located 0.3km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-090; B6).
030-IA1-141001	Finham Brook	Main river	09 April 2013	CFA18	Site located at the route crossing (Volume 5: Map Books – Ecology, Map EC-10-095; A6).
030-IA1-142001	Canley Brook	Main river	29 October 2012 and 03 April 2013	CFA18	0.25km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-096; C6).Site coincident with Environment Agency sampling site 52548.
030-IA1-142002	Canley Brook	Main river	03 April 2013	CFA18	Site located 0.1km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-096; C6).Site located in section of watercourse which will be lost following proposed realignment of Canley Brook.
030-IA1-143001	Unnamed tributary watercourse of the Canley Brook	Ordinary watercourse	04 June 2013	CFA18	Site located 0.06km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-097; F6).

[23] Distances for survey points are generally given upstream or downstream from the point at which the route of the Proposed Scheme will cross the watercourse.

Ecology survey code	Watercourse	Feature type	Survey date(s)	CFA	Distance from the Proposed Scheme[23] (km)
030-IA1-162001	River Cole	Main river	22 April 2013	CFA19	Site located at current river alignment route crossing (Volume 5: Map Books – Ecology, Map EC-10-109; B6).Sample site located in section that will be lost following Proposed Scheme realignment of River Cole.
030-IA1-162002	River Cole	Main river	22 April 2013	CFA19	Site located 0.66km downstream of current alignment route crossing (Volume 5: Map Books – Ecology, Map EC-10-109; B6).
030-IA1-164001	River Tame	Main river	29 October 2012 and 24 April 2013	CFA19 and CFA20	Site located 0.09km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-111; C4).
030-IA1-171001	Langley Brook	Ordinary watercourse	30 October 2012 and 05 April 2013	CFA20	Site located 0.05km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-115; E6).
030-IA1-172001	Gallows Brook	Ordinary watercourse	30 October 2012 and 19 April 2013	CFA20 and CFA21	Site located 0.2km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-116; G6).
030-IA1-177001	Black Brook	Main river	18 April 2013	CFA21	Site at the route crossing (Volume 5: Map Books – Ecology, Map EC-10-120; B6).
030-IA1-183001	Unnamed tributary watercourse of the Fisherwick Brook	Ordinary watercourse	18 April 2013	CFA22	Site located 0.14km downstream of route (Volume 5: Map Books – Ecology, Map EC-10-124; D6).
030-IA1-186001	Unnamed tributary watercourse of the Mare Brook	Ordinary watercourse	30 October 2012 and 11 April	CFA22	Site located immediately downstream of current alignment route crossing (Volume 5: Map Books – Ecology, Map EC-10-126; D4).
030-IA1-188001	Curborough Brook	Main river	16 April 2013	CFA22	Site located 1.4km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-127; B6).
030-IA1-190001	Bourne Brook	Ordinary watercourse	30 October 2012 and 12 April 2013	CFA22	Site located 0.25km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-129; F7).

3.3 Deviations, constraints and limitations

3.3.1 Aquatic invertebrate survey requirements for watercourses have been determined in discussion with the Environment Agency. The desk study data available do not provide sufficient information to assess the likelihood of a particular watercourse supporting important species or invertebrate communities, particularly as no recent or local data for some watercourses and limited species level data are available. Survey locations have, therefore, been agreed with relevant technical experts within the Environment Agency. Canals were excluded from aquatic invertebrate survey in discussion with the Environment Agency.

3.3.2 A summary of locations where requirement for aquatic invertebrate survey was identified but no access was available for survey is provided as Table 7.

Table 7: Summary of locations where requirement for aquatic invertebrate survey identified but no access available for survey for CFA16 to CFA22 inclusive

Watercourse	Description of proposed survey location	CFA	Distance from the Proposed Scheme (km)
Unnamed tributary watercourse of the River Itchen	Ordinary watercourse selected for survey in discussion with the Environment Agency. Crossed by route (Volume 5: Map Books – Ecology, Map EC-10-083; H5).	CFA16	Unknown – but required downstream of route crossing.
Unnamed tributary watercourse of the Langley Brook	Ordinary watercourse selected for survey in discussion with the Environment Agency. Crossed by route (Volume 5: Map Books – Ecology, Map EC-10-113; B6).	CFA20	Unknown – but required downstream of route crossing.
Unnamed tributary watercourse of the Tame	Ordinary watercourse selected for survey in discussion with the Environment Agency Crossed by route (Volume 5: Map Books – Ecology, Map EC-10-116; C6).	CFA21	Unknown – but required downstream of route crossing.
Unnamed tributary watercourse of the Black-Bourne Brook	Ordinary watercourse selected for survey in discussion with the Environment Agency. Crossed by route (Volume 5: Map Books – Ecology, Map EC-10-118; D6).	CFA21	Unknown – but required downstream of route crossing.
Unnamed tributary watercourse of Mare Brook	Main river selected for survey in discussion with the Environment Agency. Crossed by route (Volume 5: Map Books – Ecology, Map EC-10-125; G6).	CFA22	Unknown – but required downstream of route crossing.
Mare Brook	Ordinary watercourse selected for survey in discussion with the Environment Agency. Crossed by route (Volume 5: Map Books – Ecology, Map EC-10-126; H3).	CFA22	Unknown – but required downstream of route crossing.

3.4 Baseline

3.4.1 Aquatic invertebrate survey data for watercourses in this area are provided in Table 8 with particular reference to the presence of notable species.

3.4.2 Aquatic invertebrate assemblages for ponds are discussed in Volume 5: Appendix EC-001-003, Section 10.

Table 8: Summary of results for aquatic invertebrate surveys conducted in CFA16 to CFA22 inclusive

Ecological survey code	Watercourse	CFA	Survey location (NGR)	Survey date	Survey details	Survey results	Assessment
030-IA1-119001	Unnamed tributary watercourse of the River Itchen (ordinary watercourse)	CFA16	SP4465156472	02 April 2013	0.6km upstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-081; C6).	*Spring 2013* Biotic index scores were as follows: NTAXA: 17; BMWP: 71; ASPT: 4.18; LIFE(S): 7.25; CCI: 3.86 (Low); PSI: 43 (Moderately sedimented)	Spring sampling yielded 25 taxa belonging to 17 BMWP scoring family groups. Biological indices indicate a stressed community (BMWP = 71, ASPT = 4.18) of low taxon richness. The CCI value of 3.86 indicates a community of low conservation value. The assemblage has a moderate sensitivity to reduced flow (LIFE(S) = 7.25) and is indicative of a moderately sedimented system (PSI = 43).
030-IA1-119002	River Itchen (ordinary watercourse)	CFA16	SP4297155706	03 April 2013	2.0km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-082; I7).	*Spring 2013* Biotic index scores were as follows: NTAXA: 11; BMWP: 42; ASPT: 3.82; LIFE(S) (Species): 7.14; CCI: 1.17 (Low); PSI: 46 (Moderately sedimented)	Spring sampling yielded 23 taxa belonging to just 11 BMWP scoring family groups. Biological indices indicate a stressed community (BMWP = 42, ASPT = 3.82) of very low taxon richness containing a high proportion of pollution tolerant species. The CCI value of 1.17 indicates a community of low conservation value. The assemblage has a moderate sensitivity to reduced flow (LIFE(S) = 7.14) and is indicative of a moderately sedimented system (PSI = 46).
030-IA1-126001	River Itchen (ordinary watercourse)	CFA16	SP4052461835	03 June 2013	0.6km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-086; J5).	*Spring 2013* Biotic index scores were as follows: NTAXA: 24; BMWP: 122; ASPT: 5.08; LIFE(S) (Species): 6.54; CCI: 6.67 (Moderate); PSI: 43 (Sedimented)	Spring sampling yielded 35 taxa belonging to 24 BMWP scoring family groups. Biological indices indicate an unstressed community (BMWP = 122, ASPT = 5.08) of high taxon richness containing a high proportion of pollution intolerant species. The CCI value of 6.67 indicates a community of moderate conservation value on account of its species rich invertebrate fauna (containing mostly Very Common species). One Occasional taxon was recorded (occurs in 10% of samples from similar habitats), the mayfly *Centroptilum luteolum*. The assemblage has a moderate sensitivity to reduced flow (LIFE(S) = 6.54) and is indicative of a sedimented system (PSI = 43).

Ecological survey code	Watercourse	CFA	Survey location (NGR)	Survey date	Survey details	Survey results	Assessment
030-IA1-132001	Unnamed tributary watercourse of the River Leam (ordinary watercourse)	CFA17	SP3648366499	29 October 2012 and 02 April 2013	At route crossing (Volume 5: Map Books – Ecology, Map EC-10-090; H7).	*Autumn 2012* Biotic index scores are as follows: NTAXA: 14; BMWP: 60; ASPT: 4.29; LIFE(S): 7.15; CCI: 12.4 (Fairly high); PSI: 44 (Moderately sedimented) *Spring 2013* Biotic index scores were as follows: NTAXA: 14; BMWP: 58; ASPT: 4.14; LIFE(S) (Species): 7.33; CCI: 3.86 (Low); PSI: 50 (Moderately sedimented)	Species assessment – Seasonal biological indices were similar, indicating limited taxon richness (NTAXA: 14 and 14) indicative of a stressed community containing a number of pollution tolerant taxa (BMWP: 60 and 58; ASPT: 4.29 and 4.14). The community is identified as being characteristic of a moderately sedimented system (PSI: 44 and 50). T he CCI value of 12.4 (Fairly high) obtained in autumn is attributable to the presence of one beetle species, *Agabus conspersus*, which is scarce in the UK and thought to occur in <100 10km National Grid squares. This species was absent in the spring survey and as a result the CCI indicated a community of low conservation value.
030-IA1-133001	River Leam (main river	CFA17	SP3579467469	29 October 2012 and 02 April 2013	0.16km downstream of the route crossing at chainage (Volume 5: Map Books – Ecology, Map EC-10-090; B6).	*Autumn 2012* Biotic index scores are as follows: NTAXA: 22; BMWP: 105; ASPT: 4.77; LIFE(S):6.81; CCI: 7.4 (Moderate); PSI: 29 (Sedimented) *Spring 2013* Biotic index scores are as follows: NTAXA: 22; BMWP: 89; ASPT: 4.05; LIFE(S): 7.00; CCI: 7.62 (Moderate); PSI: 36 (Sedimented)	Species assessment – Seasonal biological indices were similar, indicating moderate taxon richness (NTAXA: 22 and 22), although the ASPT scores (4.77 and 4.05) are indicative of a stressed community containing a number of pollution tolerant taxa. The community is identified as being characteristic of a sedimented system (PSI: 29 and 36) which may be limiting the communities present. Individually, the CCI values (7.4 and 7.62) assess the community as being of moderate conservation value on account of them being generally diverse and the presence of the caddis, *Brachycentrus subnubilis*, which is identified as being uncommon in some parts of the country.

Ecological survey code	Watercourse	CFA	Survey location (NGR)	Survey date	Survey details	Survey results	Assessment
030-IA1-139001	River Avon (main river)	CFA18	SP3190872048	30 April 2013	0.3km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-094; A6).	*Spring 2013* Biotic index scores were as follows: NTAXA: 16; BMWP: 72; ASPT: 4.50; LIFE(S): 6.73; CCI: 4.20 (Low); PSI: 28 (Sedimented)	Biological indices indicate low taxon richness (NTAXA: 16) indicative of a stressed community containing a number of pollution tolerant taxa (BMWP: 72; ASPT: 4.50). The community is identified as being characteristic of a sedimented system (PSI: 28) with a moderate sensitivity to reduced flows (LIFE(S): 6.73). The CCI value of 4.20 indicates the presence of a community of low conservation value.
030-IA1-141001	Finham Brook (main river)	CFA18	SP3104873268	09 April 2013	At route crossing (Volume 5: Map Books – Ecology, Map EC-10-095; A6).	*Spring 2013* Biotic index scores were as follows: NTAXA: 14; BMWP: 60; ASPT: 4.29; LIFE(S) (Species): 8.08; CCI: 3.00 (Low); PSI: 63 (Slightly sedimented)	Biological indices indicate low taxon richness (NTAXA: 14) indicative of a stressed community containing a relatively high proportion of pollution tolerant taxa (BMWP: 60; ASPT: 4.29). The community is identified as being characteristic of a slightly sedimented system (PSI: 63) with a high sensitivity to reduced flows (LIFE(S): 8.08). The CCI value of 3.0 indicates the presence of a community of low conservation value.
030-IA1-142001	Canley Brook (main river)	CFA18	SP2997373761	29 October 2012 and 03 April 2013	0.25km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-096; C6). Environment Agency sampling site 52548.	*Autumn 2012* Biotic index scores are as follows: NTAXA: 21; BMWP: 104; ASPT: 4.95; LIFE(S):7.60; CCI: 7.94 (Moderate); PSI: 57 (Moderately sedimented) *Spring 2013* Biotic index scores are as follows: NTAXA: 19; BMWP: 93; ASPT: 4.89; LIFE(S): 7.79; CCI: 4.33 (Low); PSI: 56 (Moderately sedimented)	Seasonal biological indices were similar, indicating moderate taxon richness (NTAXA: 21 and 19), although the ASTP scores (4.95 and 4.89) are indicative of a slightly stressed community containing a number of tolerant taxa. The community is identified as being characteristic of a moderately sedimented system (PSI: 57 and 56) which may be limiting the communities present. The autumn 2012 CCI value assesses the community as being of moderate conservation value on account of it being generally diverse and containing the locally important (widely distributed but not common) cased caddis *Apatania muliebris* which is associated with spring-fed streams. The spring 2013 CCI value assesses the community as being of low conservation value.

Ecological survey code	Watercourse	CFA	Survey location (NGR)	Survey date	Survey details	Survey results	Assessment
030-IA1-142002	Canley Brook (main river)	CFA18	SP3001573886	03 April 2013	0.10km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-096; C6). Section which will be lost following proposed realignment of Canley Brook.	*Spring 2013* Biotic index scores were as follows: NTAXA: 15; BMWP: 69; ASPT: 4.60; LIFE(S) (Species): 8.14; CCI: 8.08 (Moderate); PSI: 59 (Moderately sedimented)	Biological indices indicate low taxon richness (NTAXA: 15) indicative of a stressed community containing a number of pollution tolerant taxa (BMWP: 69; ASPT: 4.60). The community is identified as being characteristic of a moderately sedimented system (PSI: 59) with a high sensitivity to reduced flows (LIFE(S): 8.14). The CCI value of 8.08 indicates the presence of a community of moderate conservation value on account of the presence of the locally important (widely distributed but not common) caseless caddis species *Polycentropus kingii*.
030-IA1-143001	Unnamed tributary watercourse of the Canley Brook (ordinary watercourse)	CFA18	SP2915074413	04 June 2013	0.06km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-097; F6).	*Spring 2013* Biotic index scores were as follows: NTAXA: 11; BMWP: 44; ASPT: 4.00; LIFE(S) (Species): 7.60; CCI: 1.00 (Low); PSI: 48 (Moderately sedimented)	Biological indices indicate low taxon richness (NTAXA: 11) indicative of a stressed community containing a high proportion of pollution tolerant taxa (BMWP: 44; ASPT: 4.00). The community is identified as being characteristic of a moderately sedimented system (PSI: 48). The CCI value of 1.00 indicates the presence of a community of very low conservation value.
030-IA1-162001	River Cole (main river)	CFA19	SP1898988995	22 April 2013	Sample site located in section that will be lost following Proposed Scheme realignment of River Cole (Volume 5: Map Books – Ecology, Map EC-10-109; B6).	*Spring 2013* Biotic index scores were as follows: NTAXA: 22; BMWP: 105; ASPT: 4.77; LIFE(S) (Species): 6.87; CCI: 6.14 (Moderate); PSI: 33 (Sedimented)	Biological indices indicate moderate taxon richness (NTAXA: 22) indicative of high biological water quality (BMWP: 105) although the community contains a number of pollution tolerant taxa (ASPT: 4.77). The community is identified as being characteristic of a sedimented system (PSI: 33) with a moderate sensitivity to reduced flows (LIFE(S): 6.87). The CCI value of 6.14 indicates the presence of a community of moderate conservation value on account of the reasonably diverse invertebrate community which is dominated by very common species (occur in 50-100% samples from similar habitats).

Ecological survey code	Watercourse	CFA	Survey location (NGR)	Survey date	Survey details	Survey results	Assessment
030-IA1-162002	River Cole (main river)	CFA19	SP1935989563	22 April 2013	0.66km downstream of current alignment crossing (Volume 5: Map Books – Ecology, Map EC-10-111; C4).	*Spring 2013* Biotic index scores were as follows: NTAXA: 21; BMWP: 103; ASPT: 4.90; LIFE(S) (Species): 6.91; CCI: 6.43 (Moderate); PSI: 36 (Sedimented)	Biological indices indicate moderate taxon richness (NTAXA: 21) indicative of high biological water quality (BMWP: 103) although the community contains a number of pollution tolerant taxa (ASPT: 4.90). The community is identified as being characteristic of a sedimented system (PSI: 36) with a moderate sensitivity to reduced flows (LIFE(S): 6.91). T he CCI value of 6.43 indicates the presence of a community of moderate conservation value on account of the reasonably diverse invertebrate community which is dominated by very common species (occur in 50-100% samples from similar habitats).
030-IA1-164001	River Tame (main river)	CFA19 and CFA20	SP1917191464	29 October 2012 and 24 April 2013	0.09km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-111; C4).	*Autumn 2012* Biotic index scores are as follows: NTAXA: 15; BMWP: 56; ASPT: 3.73; LIFE(S):6.54; CCI: 4.63 (Low); PSI: 16 (Heavily sedimented) *Spring 2013* Biotic index scores are as follows: NTAXA: 8; BMWP: 28; ASPT: 3.5; LIFE(S): 6.29; CCI: 4.71 (Low); PSI: 13 (Heavily sedimented)	Seasonal biological indices were variable with more taxa recorded in the autumn sample. Biological indices for both seasons indicated limited taxon richness (NTAXA: 15 and 8) and the presence of a stressed community (BMWP: 56 and 28; ASTP: 3.73 and 3.5). The community is identified as being characteristic of a heavily sedimented system (PSI: 16 and 13) which is considered to be a major factor limiting the communities present. The CCI values of 4.63 and 4.71 indicate the presence of a community of low conservation value with no species of conservation interest recorded at survey.

Ecological survey code	Watercourse	CFA	Survey location (NGR)	Survey date	Survey details	Survey results	Assessment
030-IA1-171001	Langley Brook (ordinary watercourse)	CFA20	SP1852898162	30 October 2012 and 05 April 2013	0.05km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-115; E6).	*Autumn 2012* Biotic index scores were as follows: NTAXA: 16; BMWP: 77; ASPT: 4.81; LIFE(S) (Species): 6.71; CCI: 3.60 (Low); PSI: 33 (Sedimented) *Spring 2013* Biotic index scores were as follows: NTAXA: 11; BMWP: 51; ASPT: 4.64; LIFE(S) (Species): 7.44; CCI: 3.75 (Low); PSI: 60 (Moderately sedimented)	Seasonal biological indices were variable with more taxa recorded in the autumn sample. Biological indices for both seasons indicated poor taxon richness (NTAXA: 16 and 11) and the presence of a stressed community (BMWP: 77 and 51; ASPT: 4.81 and 4.64). The community is identified as being characteristic of a moderately sedimented to sedimented system (PSI: 33 and 60). The CCI values of 3.60 and 3.75 indicate the presence of a community of low conservation value with no species of conservation interest recorded at survey.
030-IA1-172001	Gallows Brook (ordinary watercourse)	CFA20 and CFA21	SP1815799051	30 October 2012 and 19 April 2013	0.2km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-116; G6).	*Autumn 2012* Biotic index scores were as follows: NTAXA: 16; BMWP: 79; ASPT: 4.94; LIFE(S) (Species): 7.86; CCI: 11 (Fairly High); PSI: 57 (Moderately sedimented) *Spring 2013* Biotic index scores were as follows: NTAXA: 16; BMWP: 79; ASPT: 4.94; LIFE(S) (Species): 8.08; CCI: 4.09 (Low); PSI: 59 (Moderately sedimented)	Seasonal biological indices were very similar. Biological indices for both seasons indicated limited taxon richness (NTAXA: 16 in both seasons) and the presence of a stressed community (BMWP: 79 in both seasons; ASPT: 4.94 in both seasons). The community is identified as being characteristic of a moderately sedimented system (PSI: 57 and 59). The CCI value of 11.00 (indicative of the presence of a community of fairly high conservation value) in the Autumn sample is as a result of several Frequent, Occasional and Local taxa being present, including the locally important (widely distributed but not common) cased caddis *Apatania muliebris*. Many of these taxa were absent in the subsequent spring sample.

Ecological survey code	Watercourse	CFA	Survey location (NGR)	Survey date	Survey details	Survey results	Assessment
030-IA1-177001	Black Brook (main river)	CFA21	SK1504303521	18 April 2013	Site located at the route crossing (Volume 5: Map Books – Ecology, Map EC-10-120; B6).	*Spring 2013* Biotic index scores are as follows: NTAXA: 20; BMWP: 60; ASPT: 3.75; LIFE(S): 6.53; CCI: 3.86 (Low); PSI: 29 (Sedimented)	Due to access constraints, only a spring sample was attained for this sampling site. Biotic indices calculated indicate a moderately high taxon richness (NTAXA: 20), with a community dominated by moderately pollution tolerant taxa (BMWP: 60; ASPT: 3.75). The community is identified as being characteristic of a sedimented system (PSI: 29).
030-IA1-183001	Unnamed tributary watercourse of the Fisherwick Brook (ordinary watercourse)	CFA22	SK1484609083	18 April 2013	0.14km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-124; D6).	*Spring 2013* Biotic index scores were as follows: NTAXA: 27; BMWP: 82; ASPT: 4.32; LIFE(S): 6.88; CCI: 3.2 (Low); PSI: 24 (Sedimented)	Due to access constraints, only a spring sample was attained for this sampling site. Biological indices indicate a community of limited richness (NTAXA: 27) although indicative of good biological water quality (BMWP: 82) with a number of pollution tolerant taxa recorded (ASPT: 4.32). The community is identified as being characteristic of a sedimented system (PSI: 24) and as having moderate sensitivity to reduced flows (LIFE(S): 6.88). The CCI value of 3.2 (Low) confirms that no taxa of conservation interest were recorded.
030-IA1-186001	Unnamed tributary watercourse of the Mare Brook (ordinary watercourse)	CFA22	SK1418311848	30 October 2012 and 11 April 2013	Crossed by route at chainage (Volume 5: Map Books – Ecology, Map EC-10-126; D4). Sample site located immediately downstream of Proposed Scheme realignment.	*Autumn 2012* Biotic index scores are as follows: NTAXA: 7; BMWP: 20; ASPT: 2.86; LIFE(S): 5.25; CCI: 1.00 (Low); PSI: 0.0 (Heavily sedimented) *Spring 2013* Biotic index scores are as follows: NTAXA: 9; BMWP: 29; ASPT: 3.22; LIFE(S): 6.00; CCI: 1.33 (Low); PSI: 11 (Heavily sedimented)	Seasonal biological indices were similar, indicating very low taxon richness (NTAXA: 7 and 9) indicative of a community containing only pollution tolerant taxa (BMWP: 20 and 29; ASPT: 2.86 and 3.22). The community is identified as being characteristic of a heavily sedimented system (PSI: 0 and 11) and as having low sensitivity to reduced flows (LIFE(S): 5.25 and 6.00). The CCI values of 1.00 and 1.33 (Low) confirm that no taxa of conservation interest were recorded.

Ecological survey code	Watercourse	CFA	Survey location (NGR)	Survey date	Survey details	Survey results	Assessment
030-IA1-188001	Curborough Brook (main river)	CFA22	SK1334914688	16 April 2013	1.4km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-127; B6).	*Spring 2013* Biotic index scores were as follows: NTAXA: 7; BMWP: 23; ASPT: 3.29; LIFE(S): 6.20; CCI: 1.00 (Low); PSI: 14 (Heavily sedimented)	Due to access constraints, only a spring sample was attained for this sampling site. Spring biological indices indicate very low taxon richness (NTAXA: 7) indicative of a community containing only pollution tolerant taxa (BMWP: 23; ASPT: 3.29). The community is identified as being characteristic of a heavily sedimented system (PSI: 14) and having low sensitivity to reduced flows (LIFE(S): 6.20) The CCI value of 1.00 (Low) confirms that no taxa of conservation interest were recorded.
030-IA1-190001	Bourne Brook (ordinary watercourse)	CFA22	SK1084414332	30 October 2012 and 12 April 2013	0.25km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-129; F7).	*Autumn 2012* Biotic index scores are as follows: NTAXA: 26; BMWP: 152; ASPT: 5.85; LIFE(S): 7.40; CCI: 10.33 (Fairly high); PSI: 50 (Moderately sedimented) *Spring 2013* Biotic index scores are as follows: NTAXA: 19; BMWP: 91; ASPT: 4.79; LIFE(S): 7.72; CCI: 4.06 (Low); PSI: 48 (Moderately sedimented)	Seasonal biological indices indicate good/high biological water quality (BMWP: 152 and 91) with a notably taxon rich assemblage being recorded in the autumn sample (NTAXA: 26). The autumn ASPT value (5.85) indicates the presence of a community containing a relatively low number of pollution tolerant taxa. The community is identified as being characteristic of a moderately sedimented system (PSI: 50 and 48) and as having a high sensitivity to reduced flows (LIFE(S): 7.40 and 7.72) The autumn CCI value of 10.33 (Fairly high) is attributable to presence of a diverse invertebrate fauna even though no species of conservation interest we recorded in either season.

Notes: NTAXA = Number of BMWP scoring taxa, BMWP = Biological Monitoring Working Party[24], ASPT = Average Score Per Taxon, LIFE(F) = Lotic-invertebrate Index For Flow Evaluation[25] (Family/Species level), PSI= Proportion of Sediment-sensitive Invertebrates[26] CCI = Community Conservation Index.

[24] Biological Monitoring Working Party (1978), Final report: assessment and presentation of the quality of rivers in Great Britain. Unpublished report, Department of the Environment, Water Data Unit.
[25] Extence, C.A., Balbi, D.M. and Chadd, R.P. (1999), River flow indexing using British benthic macroinvertebrates: A framework for setting hydroecological objectives. Regulated Rivers: Research and Management 15, 543-574.
[26] Extence, C.A., Chadd, R.P., England, J., Dunbar, M.J., Wood, P.J. and Taylor, E.D. (2013), The assessment of fine sediment accumulation in rivers using invertebrate community response. *River Research and Applications* 29, 17-55.

CFA16 Ladbroke and Southam

Desk study

3.4.3 Environment Agency aquatic invertebrate data and related biotic indices of biological water quality are available for two monitoring sites on the River Itchen, as presented in Table 9.

Table 9: Environment Agency aquatic invertebrate data by WFD water body in CFA16

Watercourse	WFD water body ID	Site name (Site ID) and NGR	Period of record (No. of records)	Details of most recent survey
River Itchen	GB109054044070	A423 Road Bridge (79422) SP 42700 55600	03 May 2002 to 02 September 2004 (4)	Site located 2.0km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-082; I7). NTAXA: 19; BMWP: 81; ASPT: 4.26; LQI: A; LIFE(F): 5.76
		Deppers Bridge (52226) SP 40000 59300	26 March 2003 to 22 September 2009 (7)	Site located 2.5km upstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-086; J5). NTAXA: 23; BMWP: 117; ASPT: 5.09; LQI: A; LIFE (F): 6.52
		Ford Farm (51698) SP 40400 62610	18 May 2004 to 01 October 2010 (6)	Site located 1.5km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-086; J5). NTAXA: 14; BMWP: 56; ASPT:4; LQI: E; LIFE (F): 6.62; CCI: 3.38

Notes: NTAXA = Number of BMWP scoring taxa, BMWP = Biological Monitoring Working Party, ASPT = Average Score Per Taxon, LQI = Lincoln Quality Index[27], LIFE(F)/(S) = Lotic-invertebrate Index For Flow Evaluation (Family/Species level), CCI = Community Conservation Index.

3.4.4 Ford Farm was most recently sampled in 2010 and is located approximately 1.5km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-086, J5). The A423 Road Bridge monitoring site (most recently sampled in 2004) is located approximately 2km downstream of the route of the Proposed Scheme (Volume 5: Map Books – Ecology, Map EC-10-082, I7). Neither site is considered to provide an appropriate proxy for the invertebrate communities present at the respective Proposed Scheme crossing points.

3.4.5 The most recent invertebrate survey data from these sites indicates a range of water quality as reflected by the community biotic metrics (LQI: A-E). Sampling at the Ford Farm site conducted in 2013 yielded 14 taxa with both BMWP and ASPT scores reflecting the presence of a community dominated by pollution tolerant taxa, with a low conservation value (CCI:3.38).

Survey data

3.4.6 Two sites on the River Itchen and one site on each of two unnamed tributary watercourses of the River Itchen were selected for survey.

3.4.7 Survey of the River Itchen (Volume 5: Map Books – Ecology, Map EC-10-082, I7) identified a community of low taxon richness and conservation value, with only

[27] Extence, C. A., Bates, A. J., Forbs, W. J. and Barham, P. J. (1987), Biologically based water quality management. *Water Pollution* 45, 221–236.

commonly occurring taxa recorded. Surveys on the River Itchen (Volume 5: Map Books – Ecology, Map EC-10-086, J5) identified a relatively species rich assemblage dominated by pollution intolerant taxa (BMWP: 122; ASPT: 5.08) with a moderate conservation value.

3.4.8 Spatial differences in aquatic invertebrate community assemblages were also evident from available desk study data, indicating that the River Itchen exhibits variable biological water quality and habitat conditions.

3.4.9 Survey data for the unnamed tributary watercourse of the River Itchen (Volume 5: Map Books – Ecology, Map EC-10-081, C6) have identified an aquatic invertebrate community of low taxon richness and conservation value, with only commonly occurring taxa recorded.

CFA17 Offchurch and Cubbington

Desk study

3.4.10 Environment Agency aquatic invertebrate data and related biotic indices of biological water quality are available for three sites on the River Leam, as presented in Table 10.

Table 10: Environment Agency aquatic invertebrate data by WFD water body

Watercourse	WFD water body ID	Site name (Site ID) and NGR	Period of record (No. of records)	Details of most recent survey
River Leam	GB109054044140	Hunningham Bridge (51122) SP3727068450	18 May 2004 to 18 October 2011 (15)	Site located 2.3km upstream of route crossing at chainage (Volume 5: Map Books – Ecology, Map EC-10-090; B6). NTAXA: 31; BMWP: 169; ASPT: 5.45; LQI: A++; LIFE (F): 6.87; CCI: 11.93 (Moderate)
		Willes Meadow Footbridge (47062) SP3337065370	15 April 2002 to 22 October 2008 (6)	Site located 8.0km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-090; B6). NTAXA: 23; BMWP: 108; ASPT: 4.7; LQI: B; LIFE (F): 6.17; CCI: 17.5 (High)
		Princes Drive (49704) SP3091065550	26 March 2003 to 22 September 2009 (6)	Site located 11.0km downstream of route crossing (Volume 5: Map Books – Ecology, Map EC-10-090; B6). NTAXA: 16; BMWP: 86; ASPT: 4.55; LQI: B; LIFE (F): 6.00; CCI: 3.0 (Low)

Notes: NTAXA = Number of BMWP scoring taxa, BMWP = Biological Monitoring Working Party, ASPT = Average Score Per Taxon, LQI = Lincoln Quality Index, LIFE(F)/(S) = Lotic-invertebrate Index For Flow Evaluation (Family/Species level), CCI = Community Conservation Index.

3.4.11 Hunningham Bridge is the closest survey location to the route of the Proposed Scheme and was most recently surveyed in 2011.

3.4.12 The aquatic invertebrate communities of the River Leam are generally indicative of excellent to good biological water quality (as inferred from the LQI values) with the most recently available CCI values indicating a range of conservation values from low (3.0 at Princes Drive) to high (17.5 at Willes Meadow).

Survey data

3.4.13 One site on the River Leam and an unnamed tributary stream of the River Leam were selected for aquatic invertebrate survey in this area.

3.4.14 Aquatic invertebrate survey data for watercourses in this area are provided Table 8, with particular reference to the presence of notable species.

3.4.15 Aquatic invertebrates of the unnamed tributary watercourse of the River Leam (Volume 5: Map Books – Ecology, Map EC-10-090, H7) have been assessed as having fairly high conservation value. The CCI value is a result of the presence of one species of beetle (one individual recorded) which is thought to occur in <100 10km National Grid squares in the UK. However low taxon richness is indicative of a stressed community.

3.4.16 Both desk study and more recent survey data collected within 2.5km of the route of crossing (Volume 5: Map Books – Ecology, Map EC-10-090, B6) have identified the River Leam as containing aquatic invertebrate communities of moderate conservation value due to the occurrence of a moderately taxon rich assemblage that contains one species of restricted distribution.

CFA18 Stoneleigh, Kenilworth and Burton Green

Desk study

3.4.17 Environment Agency aquatic invertebrate data and related biotic indices of biological water quality are available for the River Avon, Finham Brook and Canley Brook, as presented in Table 11.

Table 11: Environment Agency aquatic invertebrate data by WFD water body

Water body	WFD water body ID	Site name (Site ID) and NGR	Period of record (No. of records)	Details of most recent survey
River Avon	GB109054043840	Ashow (53804) SP3125070170	18 May 2004 to 27 November 2008 (6)	Site located 4.2km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-094; A6). NTAXA: 23; BMWP: 120; ASPT: 5.22; LQI: A; LIFE (F): 6.83; CCI: 10.00 (Moderate)
		Blackdown (53441) SP3103069080	03 May 2002 to 22 October 2008 (7)	Site located 6.5km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-094; A6). NTAXA: 20; BMWP: 106; ASPT: 5.30; LQI: A; LIFE (F): 6.79
River Avon	GB109054043920	Stare Bridge (48445) SP3290071500	03 May 2002 to 13 November 2010 (14)	Site located 1.4km upstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-094; A6). NTAXA: 24; BMWP: 142; ASPT: 5.92; LQI: A++; LIFE (F): 7.39; CCI: 9.81 (Moderate)
Finham Brook	GB109054044480	Common Lake Kenilworth (52745) SP2979072930	12 March 2002 to 30 September 2005 (4)	Site located 1.4km upstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-095; A6). NTAXA: 23; BMWP: 116; ASPT: 5.52; LQI: A++; LIFE (F): 6.95

Water body	WFD water body ID	Site name (Site ID) and NGR	Period of record (No. of records)	Details of most recent survey
		Finham Bridge (51746) SP3304074010	12 March 2002 to 30 September 2005 (5)	Site located 3.0km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-095; A6). NTAXA: 25; BMWP: 116; ASPT: 4.64; LQI: B; LIFE (F): 7.08
Canley Brook	GB109054044520	Coventry Road Kenilworth (52548) SP2998073740	16 April 2003 to 23 November 2006 (4)	Site located 0.25km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-096; C6). NTAXA: 22; BMWP: 110; ASPT: 5.00; LQI:B; LIFE (F): 7.09
		Sir Henry Parkes Road (48892) SP3060077380	10 March 2003 to 12 October 2009 (6)	Site located 4.8km upstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-096; C6). NTAXA: 15; BMWP: 67; ASPT: 4.47; LQI: D; LIFE (F): 7.15

Notes: NTAXA = Number of BMWP scoring taxa, BMWP = Biological Monitoring Working Party, ASPT = Average Score Per Taxon, LQI = Lincoln Quality Index, LIFE (F) = Lotic-invertebrate Index For Flow Evaluation (Family level).

3.4.18 Aquatic invertebrate data are available for three monitoring sites on the River Avon, with Stare Bridge being most recently sampled in 2010. This site is located 1.4km upstream of the route of the Proposed Scheme route crossing (Volume 5: Map Books – Ecology, Map EC-10-094, A6). Of the additional sites, Ashow is located approximately 4km downstream, and Blackdown a further 2.5km downstream of the route of the Proposed Scheme. Due to the distance of these monitoring sites relative to the route of the Proposed Scheme, none are considered to provide an appropriate proxy for the invertebrate communities present at the crossing point.

3.4.19 Aquatic invertebrate data for the Finham Brook is available for two monitoring sites last sampled in 2005. Data available for the Finham Brook show that the aquatic invertebrate communities are indicative of good to excellent biological water quality with BMWP values exceeding 100 at both sites sampled. However, due to the age and location of this monitoring site relative to the route of the Proposed Scheme, it is not considered to provide an appropriate proxy for the invertebrate communities present at the crossing point.

3.4.20 Aquatic invertebrate data for the Canley Brook is limited to two aquatic invertebrate monitoring sites most recently sampled in 2009. Due to the age and relative location of the monitoring sites, the data is not considered to be an appropriate proxy for the invertebrate communities present in the watercourse.

Survey data

3.4.21 One site on each of the River Avon and Finham Brook, two sites on the Canley Brook and one site on an unnamed tributary watercourse of the Canley Brook have been selected for aquatic invertebrate survey in this area.

3.4.22 Invertebrate survey data for watercourses in this area are provided in Table 8, with particular reference to the presence of notable species.

3.4.23 Aquatic invertebrate survey data for the River Avon (0.3km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-094; A6)) have identified that the assemblage exhibits low taxon richness and is indicative of a stressed community containing a number of pollution tolerant taxa, with low conservation value (CCI: 4.20). These findings contrast with the available Environment Agency data for the River Avon which identified the presence of more species rich assemblages within 7km of the route of the Proposed Scheme, although their CCI scores assess the communities as being of moderate conservation value.

3.4.24 Aquatic invertebrate survey data for the Finham Brook (at the viaduct route crossing (Volume 5: Map Books – Ecology, Map EC-10-095; A6)) have identified that the assemblage exhibits low taxon richness and is indicative of a stressed community containing a relatively high proportion of pollution tolerant taxa. The CCI value of 3.0 assesses the community as being of low conservation value.

3.4.25 Aquatic invertebrate survey data for two sites on the Canley Brook have identified that the assemblages exhibit moderate to low taxon richness and are indicative of a stressed community containing a number of pollution tolerant taxa. The CCI values obtained at both sites assess the assemblages as being of moderate conservation value on account of the presence of two caddis species, which although identified as locally important, are widely distributed.

3.4.26 Aquatic invertebrate survey data for the unnamed tributary watercourse of the Canley Brook (0.06km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-097; F6)) have identified that the assemblages as exhibiting very low taxon richness and being indicative of a stressed community containing a relatively high proportion of pollution tolerant taxa. The CCI value of 1.0 assess the assemblage as being of low conservation value i.e. contains only common species.

CFA19 Coleshill Junction

Desk study

3.4.27 Environment Agency aquatic invertebrate data and related biotic indices of biological water quality are available for the River Cole and River Tame, as presented in Table 12.

Table 12: Environment Agency aquatic invertebrate data by WFD water body

Watercourse	WFD water body ID	Site name (Site ID) and NGR	Period of record (No. of records)	Details of most recent survey
River Cole	GB104028042420	Coleshill (52782) SP1992489512	05 March 2003 to 02November 2010 (13)	Site located 1.3km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-109; B6). NTAXA: 17; BMWP: 83; ASPT: 4.88; LQI: C; LIFE(F): 6.63; CCI: 4.5 (Low)
		Cooks Lane FCRM D/S Weir (155903) SP1749287755	20 September 2010 (1)	Site located 4.6km upstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-109; B6). NTAXA: 16; BMWP: 74; ASPT: 4.63; LQI: A; LIFE(F): 6.64; CCI: 3.0 (Low)

Watercourse	WFD water body ID	Site name (Site ID) and NGR	Period of record (No. of records)	Details of most recent survey
		Cook Lane FCRM Weir Replacement U/S Sample (155906) SP1743487917	20 September 2010 (1)	Site located 4.7km upstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-109; B6). NTAXA: 18; BMWP: 76; ASPT: 4.22; LQI: B, LIFE(F): 6.63, CCI: 4.5 (Low)
River Tame	GB104028046840	US Coleshill WRW (47747) SP1920091400	09 April 2002 to 21 September 2006 (4)	Site located 0.12km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-111; C4). NTAXA: 16; BMWP: 58; ASPT: 3.63; LQI: E; LIFE (F): 6.29; CCI: 7.0 (Moderate)
		Water Orton (47255) SP1690091400	18 April 2002 to 08 September 2011 (21)	Site located 2.6km upstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-111; C4). NTAXA: 16; BMWP: 63; ASPT: 3.94; LQI: D; LIFE (F): 6.79; CCI: 3.0 (Low)

Notes: NTAXA = Number of BMWP scoring taxa, BMWP = Biological Monitoring Working Party ASPT = Average Score Per Taxon, LQI = Lincoln Quality Index, LIFE(F)/(S) = Lotic-invertebrate Index For Flow Evaluation (Family/Species level), CCI = Community Conservation Index.

3.4.28 Environment Agency aquatic invertebrate data are available for three monitoring sites on the River Cole. The Coleshill site which has been sampled on 13 occasions between 2003 and 2010 is the closest to the route crossing (1.3km downstream (Volume 5: Map Books – Ecology, Map EC-10-109; B6)). Data from 2010 indicates the presence of a community that is reflective of good biological water quality (LQI: C). The CCI score of 4.5 identifies the invertebrate community as being of low conservation value.

3.4.29 Aquatic invertebrate data is available for two monitoring sites on the River Tame, with Water Orton being most recently sampled in 2011. This monitoring site is located approximately 2.5km upstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-111; C4) and records indicate limited taxon richness (NTAXA: 16) indicative of moderate biological water quality. The CCI score of 3.0 identifies the invertebrate community as being of low conservation value. Results from the survey conducted at the US Coleshill WRW monitoring site in 2006 (which is located approximately 120m downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-111; C4)) shows the community as having moderate conservation value (CCI score of 7.0).

Survey data

3.4.30 Two sites on the River Cole and one site on the River Tame have been selected for survey.

3.4.31 Invertebrate survey data for watercourses in this area are provided in Table 8, with particular reference to the presence of notable species.

3.4.32 Aquatic invertebrate surveys conducted on the River Cole have identified the presence of communities of moderate taxon richness in the vicinity of the Proposed Scheme. This contrasts with the most recently available Environment Agency survey data for the river at which notably fewer taxa were recorded at survey.

3.4.33 Surveys included the section of the River Cole that will be lost following its proposed realignment (030-IA1-162001-S) and a downstream site located within 1km of the route of the Proposed Scheme (030-IA1-162002-S). Biological indices were consistent with a river that exhibits good biological water quality. This stated, ASPT scores (4.77 and 4.90) indicate the presence of a of pollution tolerant taxa within the assemblage which is indicative of a stressed community. CCI scores assess the communities as being of moderate conservation value on account of the moderately diverse assemblages recorded. All species recorded were common taxa.

3.4.34 Data from surveys to support the assessment and Environment Agency aquatic invertebrate data for the River Tame are similar with biotic indices indicating the presence of community dominated by pollution tolerant taxa. Survey of a site located 90m downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-111; C4), identified that system as heavily sedimented and the community as being of low conservation value.

CFA20 Curdworth to Middleton

Desk study

3.4.35 Environment Agency aquatic invertebrate data and related biotic indices of biological water quality are available for two monitoring sites on the River Tame and three sites on Langley Brook, as presented in Table 13.

Table 13: Environment Agency aquatic invertebrate data by WFD water body in CFA20

Water body	WFD water body ID	Site name (Site ID) and NGR	Period of record (No. of records)	Details of most recent survey
River Tame	GB104028046840	US Coleshill WRW (47747) SP1920091400	09 April 2004 to 21 September 2006 (4)	Site located 0.12km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-111; C4). NTAXA: 16; BMWP: 58; ASPT: 3.63; LQI: E; LIFE(F): 6.29; CCI: 7.0 (Moderate)
		Water Orton (47255) SP1690091400	18 April 2002 to 08 September 2011 (21)	Site located 2.6km upstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-111; C4). NTAXA: 16; BMWP: 63; ASPT: 3.94; LQI: D; LIFE(F): 6.79; CCI: 3.0 (Low)
Langley Brook	GB104028046890	Middleton Road Bridge (142127) SP1756298102	03 March 2006 (1)	Site located 1km upstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-115; E6). NTAXA: 16; BMWP: 63; ASPT: 3.94; LQI: C; LIFE(F): 6.73
		Hill Farm Footbridge (142128) SP1657297481	03 March 2006 (1)	Site located 2.3km upstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-115; E6).NTAXA: 15; BMWP: 4.4; ASPT: 4.4: LQI: C; LIFE(F): 6.73

Water body	WFD water body ID	Site name (Site ID) and NGR	Period of record (No. of records)	Details of most recent survey
		40m D/S Outfall (Ford) (142133) SP1635697246	03 March 2006 (1)	Site located 2.6km upstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-115; E6).NTAXA: 14; BMWP: 54; ASPT: 3.86; LQI: C; LIFE(F): 7.00
		25m U/S Outfall (Ford) (142134) SP1629897187	03 March 2006 (1)	Site located 2.7 km upstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-115; E6). NTAXA: 19; BMWP: 86; ASPT: 4.53; LQI: A+; LIFE (F): 6.79

Notes: NTAXA = Number of BMWP scoring taxa, BMWP = Biological Monitoring Working Party, ASPT = Average Score Per Taxon, LQI = Lincoln Quality Index, LIFE(F)/(S) = Lotic-invertebrate Index For Flow Evaluation (Family/Species level), CCI = Community Conservation Index.

3.4.36 Aquatic invertebrate data and related biotic indices of biological water quality are available for two monitoring sites on this River Tame, with Water Orton being most recently sampled in 2011. This monitoring site is located approximately 2.5km upstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-111; C4). Records indicate low taxon richness (NTAXA: 16) indicative of moderate biological water quality (LQI: D). The CCI score of 3.0 identifies the aquatic invertebrate community as being of low conservation value. Results from the survey conducted at the US Coleshill WRW monitoring site in 2006 (which is located approximately 120m downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-111; C4)) identifies the community as being of similar taxon richness (NTAXA: 16) and biological water quality (LQI: E), but as having moderate conservation value (CCI score of 7.0).

3.4.37 Aquatic invertebrate data and related biotic indices of biological water quality are available for four monitoring sites for the Langley Brook (GB104028046890). Of these the Middleton Road Bridge monitoring site is located closest to the route crossing (approximately 1km upstream (Volume 5: Map Books – Ecology, Map EC-10-115; E6).

3.4.38 Aquatic invertebrate data from this site shows the community to contain a high proportion of pollution tolerant taxa (ASPT: 3.94). Overall, the biological water quality was identified as being of good quality (LQI: C). This stated, the sample collected from 2.55km Upstream Outfall (Ford) was classified in 2006 as having excellent water quality.

Survey data

3.4.39 The following sites were identified as requiring invertebrate survey:

- one site on the River Tame;
- one site on the unnamed tributary watercourse of the Langley Brook (Volume 5: Map Books – Ecology, Map EC-10-113; B6);
- one site on the Langley Brook; and
- one site on the Gallows Brook.

3.4.40 Aquatic invertebrate survey data for watercourses in this area are presented in Table 8, with particular reference to the presence of notable species.

3.4.41 Survey and desk study aquatic invertebrate data for the River Tame are similar, with biotic indices indicating the presence of an impoverished community dominated by pollution tolerant taxa. Survey of a site on the River Tame located 90m downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-111; C4), identified the system as heavily sedimented and the community as being of low conservation value.

3.4.42 Surveys recorded a relatively low taxon richness on the Langley Brook (Volume 5: Map Books – Ecology, Map EC-10-115; E6) with an impoverished community dominated by pollution tolerant taxa. The assemblages were consistent with a sedimented system and results obtained from desk study.

3.4.43 Survey data for the Gallows Brook (Volume 5: Map Books – Ecology, Map EC-10-116; G6) have identified an aquatic invertebrate community of limited taxon richness, but fairly high conservation value for this area based on the presence of several Frequent, Occasional and Local designated taxa recorded in the autumn sample. No notable rarities were recorded.

CFA21 Drayton Bassett, Hints and Weeford

Desk study

3.4.44 Environment Agency aquatic invertebrate data and related biotic indices of biological water quality are available for seven sites on the Black-Bourne Brook, as presented in Table 14.

Table 14: Environment Agency aquatic invertebrate survey data by WFD water body in CFA21

Water body	WFD water body ID	Site name (Site ID) and NGR	Period of record (No. of records)	Details of most recent survey
Black-Bourne Brook	GB104028047000	Shenstone Mill (48918) SK1140004950	2 April 2008 to 30 September 2010 (16)	Site located 5.1km upstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-120; B6). NTAXA:17; BMWP: 66; ASPT: 3.88: LQI: D; LIFE(F): 6.8: CCI: 3 (Low)
		U/S Discharge (157913) SK1216103878	8 August 2011 (1)	Site located 3.8km upstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-120; B6). NTAXA: 16; BMWP: 67; ASPT: 4.19; LQI: B; LIFE(F): 7
		D/S Discharge (157923) SK1216103878	8 August 2011 (1)	Site located 3.5km upstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-120; B6). NTAXA: 14; BMWP: 54; ASPT: 3.86; LQI: C; LIFE(F):6.67

Water body	WFD water body ID	Site name (Site ID) and NGR	Period of record (No. of records)	Details of most recent survey
		Manly Lodge D/S in Flow Trib (158184) SK1255203445	12 September 2011 (1)	Site located 3.0km upstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-120; B6). NTAXA: 15; BMWP: 57; ASPT: 3.8; LQI: C; LIFE (F): 7.08; CCI: 3 (Low)
		Thickbroom Farm (48181) SK1320003500	27 May 2004to 8 September 2011 (6)	Site located 2.2km upstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-120; B6). NTAXA: 15, BMWP: 57, ASPT: 3.8, LQI: C, LIFE(F): 7.08; CCI: 3 (Low)
		Bourne Lodge (157926) SK1479203540	8 September 2011 (1)	Site located 0.39km upstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-120; B6). NTAXA: 12; BMWP: 47; ASPT: 3.92; LQI: E; LIFE(F): 6.05
		Fazeley 75 (51780) SK2030001500	21 September 2006 to 1 April 2009 (7)	Site located 6.3km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-120; B6). NTAXA: 16; BMWP: 74; ASPT: 4.63; LQI: C; LIFE(F): 6.13

Notes: NTAXA = Number of BMWP scoring taxa, BMWP = Biological Monitoring Working Party, ASPT = Average Score Per Taxon, LQI = Lincoln Quality Index, LIFE(F)/(S) = Lotic-invertebrate Index For Flow Evaluation (Family/Species level), CCI = Community Conservation Index.

3.4.45 Bourne Lodge is the closest survey location to the route crossing and was most recently surveyed in 2011 (located 0.39km upstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-120; B6)).

3.4.46 Desk study data shows the aquatic invertebrate communities of the Black-Bourne Brook are generally indicative of good to moderate biological water quality (as inferred from the LQI values. The only available CCI values indicate a community of low conservation value (3.0 at several sites).

Survey data

3.4.47 One site on the Black Brook, one site on the Gallows Brook, one site below the confluence of two unnamed tributary watercourses of the Black-Bourne Brook system, and one site on an unnamed tributary watercourse of the River Tame were selected for aquatic invertebrate survey in this area.

3.4.48 Aquatic invertebrate survey data for watercourses in this area are provided in Table 8, with particular reference to the presence of notable species.

3.4.49 Survey data for the Gallows Brook (Volume 5: Map Books – Ecology, Map EC-10-116; G6) have identified an aquatic invertebrate community of moderate taxon richness with a fairly high conservation value based on autumn sampling. Although the highest single designation for species recorded in this assemblage was Local, several Frequent and Occasional taxa were also recorded.

3.4.50 Both desk study and survey data collected for the Black Brook (Volume 5: Map Books – Ecology, Map EC-10-120; B6) have identified aquatic invertebrate communities of

moderate taxon richness and low conservation value, with only commonly occurring taxa recorded.

CFA22 Whittington to Handsacre

Desk study

3.4.51 No desk study information is available for aquatic invertebrate populations within this area.

Survey data

3.4.52 The following watercourses were selected for aquatic invertebrate survey in this area:

- unnamed tributary watercourse of the Fisherwick Brook;
- two unnamed tributaries of the Mare Brook;
- Mare Brook;
- Curborough Brook; and
- Bourne Brook.

3.4.53 Aquatic invertebrate survey data for watercourses in this area are provided in Table 8, with particular reference to the presence of notable species.

3.4.54 Aquatic invertebrate survey of the unnamed tributary watercourse of the Fisherwick Brook (Volume 5: Map Books – Ecology, Map EC-10-124; D6) has identified the aquatic invertebrate community as having limited taxon richness although still indicative of good biological water quality. However, the CCI score indicates that the community contains no taxa of specific conservation interest.

3.4.55 Autumn and spring surveys conducted on the unnamed tributary watercourse of the Mare Brook (Volume 5: Map Books – Ecology, Map EC-10-126; D4) have identified an impoverished assemblage dominated by a few pollution tolerant taxa of low conservation value. Evidence of poor quality discharge (oil deposits observed at survey) to the watercourse from the upstream industrial estate is likely to be a factor constraining the communities recorded.

3.4.56 Survey of the Curborough Brook (Volume 5: Map Books – Ecology, Map EC-10-127; B6) has identified an impoverished assemblage dominated by a few pollution tolerant taxa of low conservation value.

3.4.57 Autumn and spring surveys of the Bourne Brook (Volume 5: Map Books – Ecology, Map EC-10-129; F7) have identified a taxon rich assemblage indicative of good/high biological water quality which contains a relatively high proportion of pollution sensitive taxa. The autumn CCI assessed the community as having fairly high conservation value on account its diversity, although only common species were recorded.

4 White-clawed crayfish

4.1 Introduction

4.1.1 This section of the appendix presents a summary of the baseline data relating to white-clawed crayfish for the section of the Proposed Scheme that will pass through CFA16 to CFA22 inclusive.

4.2 Methodology

4.2.1 Details of the standard methodology for white-clawed crayfish survey are provided in Ecology technical note: Ecological field survey methods and standards (Volume5: Appendix CT-001-000/2).

4.2.2 Desk study records relating to white-clawed crayfish were obtained from the following sources to 5km from the route of the Proposed Scheme:

- Warwickshire Biological Records Centre (WBRC);
- Staffordshire Ecological Record (SER);
- Northamptonshire Biological Records Centre (NBRC);
- Warwickshire County otter recorder (anecdotal information relating to crayfish species);
- Staffordshire Biodiversity Action Plan; and
- Warwickshire Biodiversity Action Plan

4.2.3 A summary of all surveys carried out in CFA16 to CFA22 inclusive is provided in Table 15.

Table 15: Summary of surveys for white-clawed crayfish undertaken within CFA16 to CFA22 inclusive

Ecology survey code	Water body/ watercourse	Location	Survey method and survey dates			CFA	Distance from the land required for construction of the proposed scheme[28] (m) and orientation
			Scoping Visit	Manual search	Trapping		
030-WC3-118001	Oxford Canal (Summit Pound)	SP4438755363 to SP4551054780	30 January 2013	Not suitable	8 October 2012	CFA16	Crossed by the route of the Proposed Scheme
030-WC3-129002	Grand Union Canal (Braunston to Leamington Spa)	SP3780863858 to SP3882764127	30 January 2013	Not suitable	4 October 2012	CFA17	Crossed by the route of the Proposed Scheme

[28] Hereafter the term 'land required' is used as a shortened version of the full term 'land required for the construction of the Proposed Scheme'.

Ecology survey code	Water body/ watercourse	Location	Survey method and survey dates			CFA	Distance from the land required for construction of the proposed scheme[28] (m) and orientation
			Scoping Visit	Manual search	Trapping		
030-WC2-131001	Unnamed tributary watercourse of the River Leam	SP3602366624 to SP3701865906	16 November 2012	16 November 2012, 2 July 2013	Not suitable	CFA17	Crossed by the route of the Proposed Scheme
030-WC2-132002	River Leam (confluence with River Itchen to confluence of River Avon)	SP3602366624 to SP3701865906	16 November 2012	16 November 2012, 2 July 2013	Not suitable	CFA17	Crossed by the route of the Proposed Scheme
030-WC3-138001	River Avon (Claycoton Yelvertoft Brook to confluence of the R. Sowe)	SP3329971557 to SP3242472376	20 August 2012	Not suitable	27 September 2012, 8 July 2013	CFA18	Adjacent to the land required to the
030-WC3-139001	River Avon (confluence of the R. Sowe to confluence of the R. Leam)	SP3242472376 to SP3187372053	20 August 2012	Not suitable	27 September 2012, 8 July 2013	CFA18	Crossed by the route of the Proposed Scheme
030-WC3-139002	River Sowe	Small section surveyed under 030-OT-139001 SP3242672378 to SP3248272431	20 August 2012	Not suitable	27 September 2012, 8 July 2013	CFA18	Adjacent to the land required
030-WC2-141002	Canley Brook (source to conf with Finham Brook)	SP3066573053 to SP2992674721	12 September 2012	12 September 2012	N/A	CFA18	Crossed by the route of the Proposed Scheme
030-WC2-160002	River Cole (Hatchford-Kingshurst Brook to River Blythe)	SP1885487677 to SP1926089529	11 September 2012	1 October 2012	N/A	CFA19	Crossed by the route of the Proposed Scheme
030-WC3-164002	River Tame (from Conf of the two arms to River Blythe)	SP1943791387 to SP1834091719	11 September 2012	16 July 2013	17 July 2013	CFA19 and 20	Crossed by the route of the Proposed Scheme
030-WC3-167001	Birmingham & Fazeley Canal (upper section)	SP1903594301 to SP19452951393	30 January 2013	Not suitable	4 October 2012, 16 July 2013	CFA20	Crossed by the route of the Proposed Scheme
030-WC2-171001	Langley Brook (from Source to Middleton Hall Catch)	SP1902098243 to SP1820198028	N/A	5 April 2013	N/A	CFA20	Crossed by the route of the Proposed Scheme

Ecology survey code	Water body/ watercourse	Location	Survey method and survey dates			CFA	Distance from the land required for construction of the proposed scheme[28] (m) and orientation
			Scoping Visit	Manual search	Trapping		
030-WC3-173001	Unnamed tributary watercourse of the River Tame at Brook Farm (Langley Brook from Middleton Hall Catch to R Tame	SP1792799453 to SP1722099574	15 July 2013	Not suitable	15 July 2013	CFA21	Crossed by the route of the Proposed Scheme
030-WC3-173002	Unnamed tributary watercourse of the River Tame at Shirral Hall Farm (Trib of Langley Brook downstream of confluence)	SP1766999619 to SK1664400140	5 June 2013	15 July 2013, 22 July 2013	15 July 2013, 22 July 2013	CFA21	Crossed by the route of the Proposed Scheme
030-WC3-177001	Black-Bourne Brook from source (confluence) to River Tame	SK1459303474 to SK1567302741	11 September 2012	11 September 2012, 10 July 2013,	10 July 2013, 17 July 2013	CFA21	Crossed by the route of the Proposed Scheme
030-WC3-179001	Stream and associated large pond associated with Moor Covert	SK1428605732 to SK1459305353	27 September 2012	27 September 2012, 19 July 2013	15 July 2013, 22 July 2012	CFA21	Adjacent to the land required
030-WC3-183001	Unnamed tributary watercourse of Fisherwick Brook	SK1498309246 to SK1434108892	7 August 2013	7 August 2013, 14 August 2013	7 August 2013, 14 August 2013	CFA22	Crossed by the route of the Proposed Scheme
030-WC3-183002	Wyrley and Essington Canal (disused)	SK1516909537 to SK14772311091	10 July 2013	Not suitable	10 July 2013	CFA22	Crossed by the route of the Proposed Scheme
030-WC3-183003	Coventry and Ashby Canals (Coventry Canal)	SK1516909537 to SK14772311091	10 July 2013	Not suitable	10 July 2013	CFA22	Immediately adjacent to land required, to the east
030-WC3-184001	Unnamed tributary watercourse of Mare Brook	SK1521510886 to SK1404009635	5 June 2013	15 July 2013, 22 July 2013	15 July 2013, 22 July 2013	CFA22	Crossed by the route of the Proposed Scheme
030-WC3-188001	Trent & Mersey Canal (summit to Alrewas)	SK1361113726 to SK1243313851	8 October 2012	N/A	8 October 2012	CFA22	Crossed by the route of the Proposed Scheme

Ecology survey code	Water body/ watercourse	Location	Survey method and survey dates			CFA	Distance from the land required for construction of the proposed scheme[28] (m) and orientation
			Scoping Visit	Manual search	Trapping		
030-WC3-188002	Curborough Brook (Pyford Brook Catchment (trib of Trent))	SK1304413877 to SK1286812985	27 September 2012	27 September 2012, 17 July 2013	17 July 2013, 24 July 2013	CFA22	Crossed by the route of the Proposed Scheme
030-WC3-190001	Bourne Brook (Bourne-Bilson Brook Catchment (tributary of River Trent)	SK1045613753 to SK1112514634	4 September 2012	5 September 2012, 4 October 2013	4 October 2013, 10 October 2013	CFA22	Crossed by the route of the Proposed Scheme

4.2.4 A scoping study was carried out for habitat unlikely to be suitable for white clawed crayfish, based on OS maps, aerial photography, Phase 1 habitat mapping and initial scoping visits. Table 16 details the locations which were scoped out of further survey and the rational for scoping these out.

Table 16: Rationale for scoping out requirement for further survey of watercourses/water bodies in CFA16 to 22 inclusive

Ecology Survey Code	Watercourse/ water body	Location	OS grid reference	Description and rationale for scoping watercourse/water body out of requirement for further survey	CFA
030-WC1-123001	Water body	Unnamed tributary watercourse of the River Itchen	SP4141559983 to SP4195059665	Dry at confluence with River Itchen indicating seasonal drying and therefore unsuitable conditions for white-clawed crayfish	CFA16
030-WC1-124001	Water body	Pond at Harp Farm	SP4178860041	Managed ornamental pond. Isolated from any watercourses	CFA16
030-WC1-126001	Watercourse	River Itchen	SP4007061242 to SP4047561747	Desk study records of signal crayfish on River Itchen and incidental record of signal crayfish remains during otter and water vole surveys	CFA16
030-WC1-127001	Water body	Ornamental pond within the Dallas Burston Pollo Ground	SP3946862329	Managed ornamental pond. Too isolated	CFA16
030-WC1-127002	Water body	Drain running through Long Itchington and Ufton Wood SSSI	SP3896462353 to SP3862063055	Dry drain/ ditch. Heavily shaded.	CFA16
030-WC1-131002	Water body	Burnt Firs Pond	SP3737665220	Reservoir. Too isolated	CFA17
030-WC1-136003	Water body	Unnamed tributary watercourse of River Avon at Furzon Hill Farm	SP3457869996 to SP3467570687	Agricultural ditch with silt substrate and very few refuges.	CFA17 and CFA18

Ecology Survey Code	Watercourse/ water body	Location	OS grid reference	Description and rationale for scoping watercourse/water body out of requirement for further survey	CFA
030-WC1-138002	Watercourse	Unnamed tributary watercourse of the River Avon associated with Hare's Parlour	SP3289270958 to SP3254070850	Silty ditch, dry with no suitable habitat	CFA18
030-WC1-139003	Watercourse	Unnamed tributary watercourse of the River Avon in west of unnamed woodland	SP3190272061 to SP3182872255	Dry ditch	CFA18
030-WC1-139004	Watercourse	Unnamed tributary watercourse of the River Avon in east of unnamed woodland	SP3169171934 to SP3155072054	Insufficient depth and refuges	CFA18
030-WC1-141001	Watercourse	Finham Brook (confluence Canley Brook to confluence River Sowe)	SP3087173079 to SP33129373562	Large population of signal crayfish on Canley Brook, immediate connectivity between watercourses	CFA18
030-WC1-142001	Watercourse	Unnamed tributary watercourse of the Canley Brook	SP2886074324 to SP2979174449	Dry drainage channel	CFA18
030-WC1-145001	Watercourse	Unnamed tributary watercourse of the Canley Brook	SP2873875164 to SP2819675476	Almost dry, no suitable crayfish habitat	CFA18
030-WC1-146001	Watercourse	Unnamed Drain (Draining to the Canley Brook)	SP2738875814 to SP2697775642	Very limited refuges, shallow, slow flowing ditch with deep silt. Likely subject to seasonal drying.	CFA18
030-WC1-160001	Watercourse	Unnamed tributary watercourse of the River Cole near Chelmsley Wood	SP1960686924 to SP1899288229	Small ditch over shaded by scrub. Culvert to south. Direct connectivity with River Cole where signal crayfish found	CFA19
030-WC1-161001	Watercourse	Unnamed tributary watercourse of the River Cole Coleshill Hall Farm	SP1962387708 to SP1899288229	Small shallow ditch with direct connectivity with River Cole where signal crayfish were recorded. Dry in places.	CFA19
030-WC1-161003	Watercourse	Unnamed Drain – M6 drainage (Drains into River Cole)	SP1905689286 to SP1929288606	Narrow ditch with direct connectivity with the River Cole where signal crayfish were recorded.	CFA19

Ecology Survey Code	Watercourse/ water body	Location	OS grid reference	Description and rationale for scoping watercourse/water body out of requirement for further survey	CFA
030-WC1-161004	Watercourse	Unnamed tributary watercourse of the River Cole at the Catmore	SP1861188913 to SP1849188906	Small ditch with steep banks with direct connectivity with the River Cole where signal crayfish were recorded.	CFA19
030-WC1-162001	Watercourse	Unnamed tributary watercourse of the River Cole at Grimstock	SP1942189771 to SP1928189738	Small drain, heavily shaded with high siltation with direct connectivity with the River Cole where signal crayfish were recorded.	CFA19
030-WC1-162002	Watercourse	Unnamed tributary of the River Cole at the Belt	SP1928189738 to SP1831089654	Small drain, dry in places and isolated as it passes in to culvert beneath M6 motorway.	CFA19
030-WC1-163001	Watercourse	Unnamed tributary watercourse of the River Tame	SP1941091401 to SP1821690334	Small field drain subject to extensive culvert in sections.	CFA19
030-WC1-164001	Water body	Flooded lagoon within Coleshill Sewage Works Grassland LWS	SP1938491391 to SP1883291607	Shallow seasonally flooded lagoon with limited refuge potential.	CFA19
030-WC1-164003	Watercourse	Unnamed tributary watercourse of the Tame south	SP1944791629 to SP1822791985	Concrete lined, no suitability	CFA20
030-WC1-164004	Watercourse	Unnamed tributary watercourse of the Tame north	SP1945491662 to SP1901391898	Choked drainage ditch. Dry in places.	CFA20
030-WC1-165001	Watercourse	Unnamed Drain (Drains to Tame)	SP1901391898 to SP1928792143	Choked drainage ditch. Dry in places.	CFA20
030-WC1-168001	Water body	Unnamed Drain (Drains to Middleton Hall Catchment (tributary of Langley Brook))	SP1926194778 to SP1924595278	Drainage ditch has very little flow with no refuges poor water quality and sewage fungus present	CFA20
030-WC1-168002	Watercourse	Unnamed Stream (Tributary of Middleton Hall Catchment (tributary of Langley Brook))	SP1908995175 to SP1940395496	Very little water present. No refuges. Choked with terrestrial and aquatic plants.	CFA20
030-WC1-168006	Water body	Cuttle Mill Fisheries	SP1903095017	Polluted ponds considered to have poor suitability	CFA20

Ecology Survey Code	Watercourse/ water body	Location	OS grid reference	Description and rationale for scoping watercourse/water body out of requirement for further survey	CFA
030-WC1-170001	Water body	Middleton Hall Farm Quarry Pool	SP1894397171	No inflow or outflow associated with nearby drains.	CFA20
030-WC1-172001	Watercourse	Gallows Brook	SP1848298960 to SP1768799183	Heavily shaded channel with very little flow. Fine gravel substrate with no large cobble refuges or other refuges.	CFA20 and CFA21
030-WC1-174001 and 030-WC1-174002	Water body	Unnamed Drain at Woodside Farm (Becomes a tributary of the Black-Bourne Brook from source (confluence) to River Tame)	SK1671301457 to SK1629801323	Small overgrown ditch with little or no discernible flow. Limited refuges.	CFA21
030-WC1-175001	Watercourse	Unnamed tributary watercourse of the Black-Bourne Bk (from source (confluence) to R Tame)	SK1624802079 to SK1583001367	Overgrown ditch, almost dry in places. Poor habitat for white-clawed crayfish and unlikely to be enough flow to support a population.	CFA21
030-WC1-175002	Watercourse	Unnamed Stream (Trib of Black-Bourne Bk from source (confluence) to R Tame)	SK1602001789 to SK1534502073	Small overgrown ditch with poor white-clawed crayfish habitat. Heavily overgrown with silty gravel substrate and may dry up in the summer months.	CFA21
030-WC1-177003	Water body	Unnamed drain to immediate east of Black-Bourne Brook	SK1535303015 to SK1515503387	Small drain with poor water quality. High in nutrients and anaerobic silt. Very poor aquatic invertebrate community.	CFA21
030-WC1-185001	Watercourse	Mare Brook	SK1521510886 to SK1383511231	Heavily shaded channel with silt substrate. No refuges present except small areas of small woody debris. Water quality seems poor with lots of organic debris breaking down Almost no flow and likely seasonal drying.	CFA22
030-WC1-186001	Watercourse	Unnamed tributary watercourse of Mare Brook at Fradley Business Park	SK1394512551 to SK1442211605	Stream with high silt substrates (knee-deep) with no refuges.	CFA22
030-WC1-188003	Water body	Pond to south of Trent and Mersey Canal	SK1307513208	Heavily shaded woodland pond with poor water quality, 95% cover of duckweed and deep silt.	CFA22
030-WC1-188004	Water body	Drain/stream A in Ravenshaw Wood	SK1233213482 to SK1248713477	Low flow, silty, shallow woodland drains	CFA22

Ecology Survey Code	Watercourse/ water body	Location	OS grid reference	Description and rationale for scoping watercourse/water body out of requirement for further survey	CFA
030-WC1-188005	Water body	Drain/stream B in Ravenshaw Wood	SK1253413637 to SK1230913726	Low flow, silty, shallow woodland drains	CFA22
030-WC1-188006	Water body	Drain/stream C in Ravenshaw Wood	SK1230913726 to SK1233213482	Low flow, silty, shallow woodland drains	CFA22
030-WC1-189001	Water body	Drain/stream D in Ravenshaw Wood	SK1235313807 to SK1161414560	Dry ditch	CFA22
030-WC1-189003	Water body	Black Slough Farmdrain network	SK1162614307 to SK1166514618	Dry ditch	CFA22
030-WC1-190002	Water body	Pond to south of Bourne brook	SK1089913990	Subject to seasonal drying	CFA22
030-WC1-190003	Water body	Ponds associated with Bourne brook	SK1080314392	Isolated – no inflow to Bourne Brook	CFA22
030-WC1-191001	Water body	Unnamed Drain A (Becomes a trib of Trent)	SK0999314514 to SK0972215624	Dry ditch	CFA22
030-WC1-192001	Water body	Unnamed Drain B (Becomes a trib of Trent)	SK0923715131 to SK0971415298	Dry ditch	CFA22

4.3 Deviations, constraints and limitations

4.3.1 Surveys at the Bourne Brook (030-WC3-190001) in the Whittington to Handsacre area (CFA22) were carried out outside the July to September period in 2012. Therefore an additional manual refuge and trapping survey was undertaken in August 2013 to supplement the survey effort and to further validate likely absence of this species.

4.3.2 Limitations to the surveys were:

- Manual survey effort was reduced to three habitat patches at the unnamed tributary watercourse of the River Leam at Ash Beds (030-WC2-131001) in the Ladbroke and Southam area (CFA17) due to a lack of suitable refuges to search. However due to the limited refuge resource in this watercourse and thus low suitability, survey effort was considered to be sufficient on this watercourse and thus this not considered to be a significant limitation to survey effort;
- Inclement weather was experienced overnight during trapping surveys of an unnamed tributary watercourse of the Mare Brook (030-WC3-184001) on 22 and 23 July 2013 in the Whittington to Handsacre area (CFA22). However no crayfish were found in either of two manual surveys or an additional trapping survey. Given the fact that this channel has storm sewage discharge and other

water quality problems as well as flash flows, it is extremely unlikely that crayfish would inhabit this watercourse;

- Manual survey techniques could not be undertaken on an unnamed tributary watercourse of the Fisherwick Brook (030-WC3-183001) in the Whittington to Handsacre area (CFA22) due to the heavily choked nature of the stream and the lack of accessible in channel refuges. The survey was thus supplemented by netting techniques and there was no significant limitation to survey effort;
- Manual survey effort increased from five to seven habitat patches at the Unnamed tributary watercourse of the River Tame at Brook Farm (Langley Brook from Middleton Hall Catch to R Tame) (030-WC-173001) in the Drayton Bassett, Hints and Weeford area (CFA21) due to a lack of suitable refuges to search, although not enough searchable area was available to achieve double survey effort (ten habitat patches) within the accessible land. However due to the limited refuge resource in this watercourse and thus low suitability, survey effort was considered to be sufficient on this watercourse and thus this not considered to be a significant limitation to survey effort;
- Access to part of the Black-Bourne Brook (030-WC3-177001) at land reference SF529832 in the Drayton Bassett, Hints and Weeford area (CFA21) was limited due to game birds being kept on part of the land. All accessible part of the river was manual searched, resulting in only four habitat patches being surveyed. These were also extended in length due to a lack of suitable searchable refuges. However subsequent surveys in adjacent land parcels supplemented the survey effort of this watercourse and therefore the surveys were not considered significantly limited; and
- Trapping surveys could not be undertaken on the River Tame (030-WC3-164002) as the flow, turbidity and water levels trapping surveys. These surveys were supplemented by the use of Artificial Refuge Traps (ART) and manual searches of suitable reaches of side-waters associated with this watercourse. However survey effort was considered to still be restricted on this watercourse. However, there are no in-channel works proposed on this watercourse and it is not considered that the restrictions encountered are a significant limitation.

4.3.3 Where overall access on a watercourse was low there is the potential for white-clawed crayfish to be present on isolated reaches that were not surveyed. Negative results on these watercourses are therefore treated with a degree of caution.

4.3.4 The watercourses and water bodies where no surveys were possible due to access limitations are presented in Table 17.

Table 17: Watercourses/ water bodies with no access in CFA16 to CFA22 inclusive

Ecology survey code	Watercourse/ water body	Feature type	OS Grid Reference (Start and Finish)	CFA number
030-WC-119001	Unnamed Drain at Church Farm (Drains to tributary of Itchen)	Drain	SP4472556025 to SP4464955720	CFA16
030-WC-120001	Unnamed tributary watercourse of the River Itchen	Ordinary watercourse	SP4457156487 to SP4375456474	CFA16

Ecology survey code	Watercourse/ water body	Feature type	OS Grid Reference (Start and Finish)	CFA number
030-WC-120002	River Itchen (source to conf with R Stowe)	Ordinary watercourse	SP4438757138 to SP4364656760	CFA16
030-WC-120003	Chapel Bank Cottage Ponds	Terrestrial site and ponds	SP4416557027	CFA16
030-WC-122001	Unnamed tributary watercourse of the River Itchen at Ladbroke	Ordinary watercourse	SP4346358780 to SP4276658348	CFA16
030-WC-122002	Unnamed Drain at Ladbroke (Drains to Tributary of Itchen)	Drain	SP4282858339 to SP4284858169	CFA16
030-WC-126002	Unnamed tributary watercourse of the River Itchen associated with landfill site	Ordinary watercourse	SP4002561355 to SP3989561331	CFA16
030-WC-126003	Unnamed tributary watercourse of the River Itchen at Lower Farm	Ordinary watercourse	SP4006661459 to SP3976761613	CFA16
030-WC-126004	Field pond near to tributary of the River Itchen	Pond	SP3976761613 to SP4006661459	CFA16
030-WC-127003	Unnamed tributary watercourse of the River Itchen at Bascote Heath	Ordinary watercourse	SP3961562443 to SP4004962596	CFA16
030-WC-129001	Unnamed tributary watercourse of the River Leam	Ordinary watercourse	SP3779563837 to SP3882864104	CFA17
030-WC-129003	Unnamed tributary watercourse of the River Leam at Lower Print Farm	Ordinary watercourse	SP43863664030 to SP3863764401	CFA17
030-WC-132001	Unnamed Drain (Draining to the Leam) at Manor Farm, Offchurch	Drain	SP3648565959 to SP3604766311	CFA17
030-WC-135001	Pingle brook	Ordinary watercourse	SP3463068410 to SP3469468702	CFA17
030-WC-136001	Unnamed tributary watercourse A of River Avon	Ordinary watercourse	SP3485569742 to SP3457869996	CFA17
030-WC-136002	Unnamed tributary watercourse B of River Avon	Ordinary watercourse	SP3528669496 to SP3457869996	CFA17
030-WC-136004	Unnamed tributary watercourse of River Avon at Cotton Mill Spinney	Ordinary watercourse	SP3388169593 to SP3339369930	CFA17
030-WC-168003	Unnamed Stream at Middleton House Farm (Trib of Middleton Hall Catch (trib of Langley Brook))	Ordinary watercourse	SP1937296134 to SP1866996133	CFA20
030-WC-168004	Drain associated with Kingsbury Water Park	Drain	SP2006595765 to SP2008796215	CFA20
030-WC-169001	Unnamed Stream at Maple Leaf Farm (Trib of Middleton Hall Catch (trib of Langley Brook))	Ordinary watercourse	SP1866196469 to SP1953096908	CFA20
030-WC-169002	Unnamed Stream at Pool House Farm (Trib of Langley Brook)	Ordinary watercourse	SP1829896817 to SP1953096908	CFA20
030-WC-171002	Middleton Pools	Pond	SP1902098243	CFA20
030-WC-189002	Unnamed Drain (Becomes a tributary of the Pyford Brook Catchment (tributary of River Trent))	Drain	SK1201014287 to SK1245214676	CFA22

4.4 Baseline

Overview

4.4.1 Current trends indicate the continued national decline of white-clawed crayfish as a result of direct habitat loss and deterioration, pollution, crayfish plague and direct competition from non-indigenous crayfish species.

4.4.2 It is considered that, without intervention, the decline of any remaining white-clawed crayfish populations within Warwickshire and Staffordshire will continue. This risk of decline is likely to be accelerated in both the Avon and Tame catchments due to the recorded presence of non-native signal crayfish (*Pacifastacus leniusculus*).

4.4.3 Non-indigenous crayfish are likely to have a serious detrimental effect on any white-clawed crayfish present on a watercourse reach through the spread of disease such as crayfish plague.

4.4.4 In light of recent historical (last 20 years) spatial and temporal trends in lowland stream ecosystem structure and function it is anticipated that continued improvements to stream and ground water quality, combined with improvements in habitat quality, will arise through the implementation of the Water Framework Directive (WFD) and the drive towards a more sustainable approach to water use.

4.4.5 These improvements are likely to result in the continued increase in the proportion of pollutant intolerant taxa (invertebrates, fish and aquatic macrophytes). However populations of white-clawed crayfish may also become more susceptible to alteration arising from anthropogenic changes such as improved connectivity of watercourse reaches. Over such timescales changes to aquatic system species richness and the potential for non-native species range expansion are less predictable due to the current influence of barriers to free species movement and catchment biogeography.

4.4.6 Warwickshire County Council, under the Warwickshire Biodiversity Action Plan (BAP) have produced a species action plan for this species which includes targets to increase population size and range by attempting to establish 10 new colonies of white-clawed crayfish (by 2010). However the current implementation of this target is currently unknown.

4.4.7 A summary of all crayfish encountered during surveys is given in Table 18.

Table 18: Summary of crayfish records from surveys undertaken in CFA16 to CFA22 inclusive

Ecology survey code	Location and watercourse	OS grid reference	Species recorded and number	Survey method yielding record	CFA	Distance from the land required for construction of the Proposed Scheme[29] (m) and orientation
030-WC3-118001	Oxford Canal	SP4372055363	Signal crayfish (1 no.)	Baited trapping survey	CFA16	Within land required

[29] Hereafter the term 'land required' is used as a shortened version of the full term 'land required for the construction of the Proposed Scheme'.

Ecology survey code	Location and watercourse	OS grid reference	Species recorded and number	Survey method yielding record	CFA	Distance from the land required for construction of the Proposed Scheme[29] (m) and orientation
030-WC1-126001	River Itchen	SP4039661681	Signal crayfish remains (1 no.)	Incidental record during otter survey	CFA16	131m east
030-WC3-129002	Grand Union Canal	SP3843063926	Signal crayfish (2 no.)	Baited trap and artificial refuge traps (ARTs)	CFA17	Within land required
030-WC2-141002	Canley Brook	SP3030573480 to SP3012973567	Signal crayfish (8 no.)	Manual survey	CFA18	115m north-east
030-WC2-160002	River Cole	SP1946089611 to SP1932289563	Signal crayfish (2 no.)	Manual survey	CFA19	5m east
030-WC2-171001	Langley Brook	SP1854498171	White-clawed crayfish (2 no.)	Incidental records during electro-fishing	CFA20	43m east
030-WC3-183003	Coventry Canal	SK1518609691	Signal crayfish (1 no.)	Trapping survey	CFA22	5m east
030-WC3-188001	Trent and Mersey Canal	SK1280013506 to SK1293313324	Signal crayfish (11 no.)	Trapping survey	CFA22	Within land required

CFA16 Ladbroke and Southam

4.4.8 There are eight watercourses and five water bodies within the Ladbroke and Southam area.

4.4.9 The land required for the Proposed Scheme directly crosses a total of four watercourses, including the Oxford Canal (030-WC2-118001), the River Itchen at two locations (030-WC-120002 and 030-WC1-126001) and two unnamed tributary watercourses of the River Itchen (030-WC-120001 and 030-WC-122001).

4.4.10 There are two unnamed tributary watercourses of the River Itchen (030-WC1-123001 and 030-WC-127003) and two water bodies (Unnamed Drain at Church Farm (Drains to Tributary of Itchen) 030-WC-119001 and Chapel Bank Ponds 030-WC-120003) located within the land required for the construction of the Proposed Scheme.

4.4.11 A further two watercourses (unnamed tributary watercourse of the River Itchen associated with landfill site 030-WC-126002 and unnamed tributary watercourse of the River Itchen at Lower Farm 030-WC-126003) and three water bodies (unnamed drain at Ladbroke 030-WC-122002, field pond near to the tributary of the River Itchen 030-WC-126004 and drain in Long Itchington and Ufton Wood SSSI 030-WC1-127002) are located outside the land required for the construction of the Proposed Scheme.

4.4.12 Of these the Oxford Canal (030-WC3-118001), an unnamed tributary of the River Itchen (030-WC1-123001), River Itchen (030-WC1-126001) and the drain running through Long Itchington and Ufton Wood SSSI (030-WC1-127002) have been subject to survey.

4.4.13 No evidence of white-clawed crayfish has been found during field surveys within this area.

4.4.14 The desk study highlighted one record of white-clawed crayfish within this area on the River Itchen approximately 1.1km upstream of the land required for the construction of the Proposed Scheme, from 2004.

4.4.15 Information obtained from the Warwickshire County Recorder for otter highlighted records of signal crayfish at Ufton Hill Local Wildlife Site (LWS), a site located approximately 1.7km west (upstream) of the land required for the construction of the Proposed Scheme and with connectivity with the River Itchen.

4.4.16 There is a further record of signal crayfish 66om east (downstream) of the land required for the construction of the Proposed Scheme at Southam, on the River Stowe in 2002. This watercourse also has connectivity with the River Itchen.

4.4.17 White-clawed crayfish absence is assumed on both the River Itchen (030-WC1-126001) and a further unnamed tributary watercourse of the River Itchen (030-WC1-123001), both of which were only subject to partial surveys. The latter was also dry at its confluence with the River Itchen indicating seasonal drying and therefore unsuitable conditions for white-clawed crayfish.

4.4.18 Signal crayfish have been confirmed on both the Oxford Canal and the River Itchen. Due to the connectivity of the remainder of watercourses and water bodies within this area (all unnamed tributaries of the River Itchen) it is possible that non indigenous signal crayfish present in the River Itchen watercourse have also colonised these tributaries.

4.4.19 Due to the known declining status of white-clawed crayfish within Warwickshire and the continued decline of this species recorded throughout watercourses in the county, in addition to the recorded presence of non-indigenous signal crayfish on the Oxford Canal and River Itchen where white-clawed crayfish were previously recorded, it is likely that any populations existing on these watercourses have now been lost.

4.4.20 However it is possible that isolated populations of native white-clawed crayfish exist on other watercourses, in particular upstream tributaries further from the main watercourse where structures such as weirs may have restricted the spread of non-indigenous crayfish species.

CFA17 Offchurch and Cubbington

4.4.21 There are 10 watercourses and one water body within the Offchurch and Cubbington area.

4.4.22 The Proposed Scheme directly crosses a total of four watercourses, including the Grand Union Canal (030-WC3-129002), two unnamed tributary watercourses of the River Leam (030-WC-129001 and 030-WC2-131001) and the River Leam (030-WC2-132002).

4.4.23 There are five watercourses and one water body located within the land required for the construction of the Proposed Scheme, comprising the Pingle Brook (030-WC-135001), four further unnamed watercourses (030-WC-136001, 030-WC-136002, 030-WC1-136003 and 030-WC-136004) and one unnamed drain (030-WC-132001).

4.4.24 A further watercourse (unnamed tributary watercourse of the River Leam at Lower Print Farm 030-WC-129003) is located outside the land required for the construction of the Proposed Scheme.

4.4.25 Four of these watercourses have been surveyed for white-clawed crayfish; comprising the Grand Union Canal (030-WC3-129002), an unnamed tributary of the River Leam (030-WC1-131002), River Leam (030-WC2-132002) and a further unnamed watercourse (030-WC1-136003).

4.4.26 No evidence of white-clawed crayfish has been found during field surveys within this area and the desk study did not highlight any current records of white-clawed crayfish on any watercourses within a 5km radius of the Proposed Scheme within the area.

4.4.27 The closest record of non-native crayfish within this area is approximately 3.5km south east of the land required for the construction of the Proposed Scheme comprising a record of a signal crayfish found on the River Stowe at its confluence with the River Itchen. The River Itchen has connectivity with both the Grand Union Canal and River Leam.

4.4.28 Signal crayfish have been confirmed on the Grand Union Canal and thus white-clawed crayfish are assumed absent here.

4.4.29 White-clawed crayfish are also assumed absent on the River Leam (030-WC2-132002), an unnamed tributary of the River Leam at Ash Beds (030-WC2-131001) and a further unnamed tributary watercourse of the River Avon (030-WC1-136003) on their reaches as they pass within the land required for the Proposed Scheme due to a lack of positive field survey results.

4.4.30 Due to the connectivity of 030-WC-129001, 030-WC-129003, 030-WC2-131001, and 030-WC-132001 with the River Itchen in Ladbroke and Southam it is possible that non indigenous signal crayfish present in the River Itchen (to the south of this area) and the Grand Union Canal have also colonised these watercourses. However it is possible that isolated populations of native white-clawed crayfish exist on these watercourses, in particular upstream tributaries further from the main watercourse.

4.4.31 Due to the known declining status of white-clawed crayfish within Warwickshire and the continued decline of this species recorded throughout watercourses in the county, in addition to the recorded presence of non-indigenous signal crayfish on the Grand Union Canal and River Itchen it is likely that any populations existing on these watercourses have now been lost.

CFA18 Stoneleigh, Kenilworth and Burton Green

4.4.32 There are 11 watercourses and one water body within the Stoneleigh, Kenilworth and Burton Green area.

4.4.33 The Proposed Scheme directly crosses a total of five watercourses and one water body, including the River Avon (030-WC3-139001), Finham Brook (030-WC1-141001),

Canley Brook (030-WC2-141002), two unnamed tributary watercourses of the Canley Brook (030-WC1-142001 and 030-WC1-145001) and unnamed drain of the Canley Brook (030-WC1-146001).

4.4.34 There are four watercourses located within the land required for the construction of the Proposed Scheme, comprising unnamed watercourse (030-WC1-136003), a reach of the River Avon (030-WC3-138001 and two unnamed tributary watercourses of the River Avon (030-WC1-138002 and 030-WC1-139003).

4.4.35 There are a further two watercourses (River Sowe 030-WC3-139001 and unnamed tributary watercourse of the River Avon 030-WC1-139004) located outside the land required for the construction of the Proposed Scheme within the Stoneleigh, Kenilworth and Burton Green area.

4.4.36 All of the watercourses and water bodies scoped in within the Stoneleigh, Kenilworth and Burton Green study area have been subject to survey.

4.4.37 No evidence of white-clawed crayfish has been found during the field surveys within this area.

4.4.38 The Warwickshire BAP mentions populations of white-clawed crayfish are thought to still be present on parts of the River Avon, as well as the River Leam and the River Itchen located to the south of this area[30]. However, the desk study did not highlight any current records of white-clawed crayfish on any watercourses within a 5km radius of the Proposed Scheme.

4.4.39 The desk study records also indicate current records of signal crayfish on the River Sowe, with the closest record located approximately 2.8km north-east of the land required for the construction of the Proposed Scheme between 2000 and 2003. The River Sowe has aquatic connectivity with the River Avon.

4.4.40 Signal crayfish have been confirmed on the Canley Brook (030-WC2-141002).

4.4.41 It is assumed from the results of surveys that the Finham Brook (030-WC1-141001) due to its connectivity with Canley Brook is unlikely to support any viable population of white-clawed crayfish due to the presence of non-indigenous signal crayfish, which were found in abundance on the Canley Brook.

4.4.42 White-clawed crayfish absence is assumed on the River Avon (030-WC3-138001 and 030-WC3-139001) and two unnamed tributary watercourses of the River Avon (030-WC1-139003 and 030-WC1-139004) where no individuals were recorded during surveys.

4.4.43 Due to the connectivity of the remainder of watercourses within this area (all unnamed tributaries of the River Avon or unnamed tributaries of the Canley Brook) it is possible that non indigenous signal crayfish present in the Canley Brook and River Sowe would have also colonised these tributaries. However it is possible that isolated populations of native white-clawed crayfish exist on these watercourses, in particular upstream tributaries further from the main watercourse where structures such as weirs may have restricted the spread of non-indigenous crayfish species.

[30] Warwickshire BAP, http://www.warwickshire.gov.uk/Web/corporate/pages.nsf/Links/664C36342CE8DE8180256E910041C62C/$file/Crayfish.pdf.

CFA19 Coleshill Junction

4.4.44 There are eight watercourses and one water body within the Coleshill Junction area.

4.4.45 The Proposed Scheme directly crosses a total of six watercourses within this area, including the River Cole at two locations (030-WC2-160002), The River Tame (030-WC3-164002), Coleshill Hall Brook (030-WC1-1610001) and three further unnamed tributary watercourses of the River Cole (030-WC1-160001, 030-WC1-162002 and 030-WC1-163001)

4.4.46 There are two further unnamed tributary watercourses of the River Cole (030-WC1-161004 and 030-WC1-162001) and one water body comprising a drain associated with the M6 Motorway (030-WC1-161003) which fall outside of the land required for the construction of the Proposed Scheme.

4.4.47 All of the watercourses and water bodies scoping in within the Coleshill Junction study area have been subject to survey.

4.4.48 The desk study did not highlight any current records of white-clawed crayfish on any watercourse reaches within a 5km radius of the Proposed Scheme within the Coleshill Junction area.

4.4.49 White-clawed crayfish absence is assumed on the River Tame (030-WC3-164002) where surveys have not established current presence on the reach of this watercourse within the Coleshill Junction area.

4.4.50 No evidence of white-clawed crayfish has been found during field surveys within this area. Signal crayfish have been confirmed the River Cole.

4.4.51 Due to the connectivity of six of the watercourses and one drain within this area (all unnamed tributaries of the River Cole) it is possible that non indigenous signal crayfish present in the River Cole watercourse have also colonised these tributaries. However it is possible that isolated populations of native white-clawed crayfish exist on these watercourses, in particular upstream tributaries further from the main watercourse where structures such as weirs may have restricted the spread of non-indigenous crayfish species.

4.4.52 Due to the known declining status of white-clawed crayfish within Warwickshire and the continued decline of this species recorded throughout watercourses in the County, and the presence of non-indigenous species on the River Cole, it is unlikely that any population of white-clawed crayfish will be present on any tributaries of the River Cole within the Coleshill Junction area.

CFA20 Curdworth to Middleton

4.4.53 There are 10 watercourses and five water bodies within the Curdworth to Middleton area.

4.4.54 The Proposed Scheme directly crosses all 10 watercourses:

- River Tame (030-WC3-164002);
- Two unnamed tributary watercourses of the River Tame (030-WC1-164003 and 030-WC1-164004);

- Birmingham and Fazeley Canal (030-WC3-167001);
- Four unnamed streams (030-WC1-168002 and 030-WC-168003, 030-WC-169001 and 030-WC-169002);
- Langley Brook (030-WC2-171001); and
- Gallows Brook (030-WC1-172001).

4.4.55 There are two water bodies within the land required for the construction of the Proposed Scheme, comprising two unnamed drains (030-WC1-165001 and 030-WC1-168001).

4.4.56 A further three water bodies are located outside the land required for the construction of the Proposed Scheme, comprising the drain in North Wood (030-WC-168005), drain associated with Kingsbury Water Park, (030-WC-168004) and Middleton Pools (030-WC-171002).

4.4.57 The following watercourses have been surveyed for white-clawed crayfish:

- Two unnamed tributary watercourses of the River Tame (030-WC1-164003 and 030-WC1-164004);
- Unnamed drain (030-WC1-165001);
- Birmingham and Fazeley Canal (030-WC3-167001);
- Two unnamed streams (030-WC1-168001 and 030-WC1-168002);
- Langley Brook (030-WC2-171001); and
- Gallows Brook (030-WC1-172001).

4.4.58 Survey results have identified the presence of white-clawed crayfish on the Langley Brook (030-WC2-171001) as it passes within the land required for the construction of the Proposed Scheme. Additionally there are no records of non-indigenous crayfish within this area.

4.4.59 The desk study did not highlight any current records of white-clawed crayfish on any watercourse reaches within a 5km radius of land required for the Proposed Scheme. However the Warwickshire BAP mentions white-clawed crayfish being present at Middleton Hall, (despite not being listed in the Middleton Pool SSSI citation). Middleton Pool has direct aquatic connectivity with the Langley Brook within this area.

4.4.60 There are no non-indigenous species recorded in the watercourses within 5km of the Proposed Scheme.

4.4.61 White-clawed crayfish absence is assumed on the River Tame (030-WC3-164002) and Birmingham and Fazeley Canal (030-WC3-167001) following full survey of these watercourses for this species.

4.4.62 Absence is also assumed on a further five watercourses and one water body within this area, comprising Gallows Brook (030-WC1-172002), two unnamed tributary watercourses of the Tame (030-WC1-164003 and 030-WC1-164004), a further two

drains associated with the Langley Brook (030-WC1-168001 and 030-WC1-168002) and Cuttle Mill Fisheries (030-WC1-168006) due to unsuitable habitat conditions for white-clawed crayfish (i.e. dry, concrete lined channels, acidic pH etc.)

4.4.63 A further three watercourses and two water bodies within this area have not been surveyed (030-WC-168003, 030-WC-169001, 030-WC-169002, 030-WC-168004 and 030-WC-171002). These comprise unnamed tributary streams of the Langley Brook and two water bodies with direct connectivity (inflow and outflow) with the Langley Brook (030-WC2-171001) and an unnamed tributary watercourse of the Langley Brook (030-WC-168003) respectively. Due to the immediate aquatic connectivity of the remainder of watercourses and water bodies within this area it is possible that if suitable habitat conditions are present that white-clawed crayfish could have also colonised these watercourse reaches. For the purpose of this assessment and the connectivity of these watercourses with the Langley Brook, presence of white-clawed crayfish is currently assumed on these three watercourses.

CFA21 Drayton Bassett, Hints and Weeford

4.4.64 There are seven watercourses and five water bodies within the Drayton Bassett, Hints and Weeford area.

4.4.65 The Proposed Scheme directly crosses a total of six watercourses, comprising the Gallows Brook (030-WC1-172001), two unnamed tributary watercourses of the River Tame (030-WC3-173001 and 030-WC3-173002), two unnamed tributary watercourses of the Black-Bourne Brook (030-WC1-175001 and 030-WC1-175002) and the Black-Bourne Brook (030-WC3-177001).

4.4.66 There are two water bodies located within the land required for the construction of the Proposed Scheme, comprising an unnamed drain becoming a tributary of the Black-Bourne Brook (030-WC1-174001) and an unnamed drain associated with the Black-Bourne Brook (030-WC1-177003).

4.4.67 A further watercourse (030-WC3-179001) and three water bodies (030-WC1-174002, 030-WC-177002 and 030-WC2-179002) are located outside the land required for the construction [or operation] of the Proposed Scheme.

4.4.68 The following watercourses and water bodies have been surveyed for white-clawed crayfish:

- Gallows Brook (030-WC-172001);
- Two unnamed tributary watercourses of the River Tame (030-WC3-173001 and 030-WC3-173002);
- Black-Bourne Brook (030-WC3-177001); and
- Unnamed stream (030-WC3-179001).

4.4.69 All of the watercourses and water bodies that were scoped in within the Drayton Bassett, Hints and Weeford study area have been subject to survey.

4.4.70 No evidence of white-clawed crayfish or non indigenous crayfish has been found during surveys within this area.

4.4.71 There is one current record of white-clawed crayfish (a count of four individuals) at Dosthill Quarries in 2006, located approximately 2.5km east of the land required for the construction of the Proposed Scheme. This site appears to have no definitive inflow or outflow and thus has no known aquatic connectivity with the Proposed Scheme.

4.4.72 Surveys of the watercourses and drains within the Drayton Bassett, Hints and Weeford area have not established current presence of white-clawed crayfish and thus the species is assumed absent. However the confidence level in assumed absence is reduced on those watercourses where only limited access was available for survey (i.e.030-WC3-173002), as it is possible that white-clawed crayfish populations could be missed if the watercourse reaches not yet subject to survey comprise more favourable localised habitat features and conditions.

4.4.73 Due to the known declining status of white-clawed crayfish within Staffordshire and the continued decline of this species recorded throughout watercourses in the County it is possible that white-clawed crayfish may be absent from watercourses within the Drayton Bassett, Hints and Weeford study area.

CFA22 Whittington to Handsacre

4.4.74 There are nine watercourses and 11 water bodies within the Whittington to Handsacre area.

4.4.75 The Proposed Scheme directly crosses a total of eight watercourses within this area, including the Trent and Mersey Canal at three locations (030-WC3-188001), a disused section of the Wyrley and Essington Canal (030-WC3-183002), Curborough Brook (030-WC3-188002), Mare Brook (030-WC1-185001) and Bourne Brook (030-WC3-190001), as well as a further two unnamed tributary watercourses of the Mare Brook (030-WC3-184001 and 030-WC1-186001) and one unnamed tributary watercourse of the Fisherwick Brook (030-WC3-183001).

4.4.76 Three drains (030-WC1-189001, 030-WC1-191001 and 030-WC1-192001) are also directly crossed by the route.

4.4.77 The Coventry Canal (030-WC2-183003), two drains (, 030-WC2-188005 and 030-WC-189002) and three ponds (030-WC1-188003, 030-WC1-190002, 030-WC1-190003) fall within the land required for the construction of the Proposed Scheme.

4.4.78 A further three drains (030-WC1-189003, 030-WC2-188004 and 030-WC2-188006) are located outside the land required for the construction of the Proposed Scheme.

4.4.79 All nine watercourses and 10 of the 11 water bodies have been surveyed for white-clawed crayfish.

4.4.80 No evidence of white-clawed crayfish has been found within this area.

4.4.81 The desk study did not highlight any records of white-clawed crayfish in the last two years on any watercourses within a 5km radius of land required for construction of the Proposed Scheme.

4.4.82 There are two older records of white-clawed crayfish on an unnamed watercourse (030-WC3-183001) near Huddlesford, located approximately 700m (2005) and 1km

(2000) east (and downstream) of the land required for the construction of the Proposed Scheme, respectively.

4.4.83 The Stowe Pool and Walk Mill is a SSSI, designated for its large population of white-clawed crayfish, located approximately 2.5km west of the land required for the construction of the Proposed Scheme. The aquatic connectivity between this site and the Proposed Scheme is currently anticipated to be poor as the SSSI citation suggests limited connectivity with adjacent watercourses.

4.4.84 Signal crayfish have been confirmed on both the Trent and Mersey Canal and the Coventry Canal at its confluence with disused Wyrley and Essington Canal arm (currently a marina associated with the Coventry Canal) within the area. Due to the immediate locality of confirmed signal crayfish on the Coventry Canal to the disused arm of the Wyrley and Essington Canal and the connectivity that exists between these two water bodies the presence of signal crayfish is also assumed on the disused arm of the Wyrley and Essington Canal.

4.4.85 Surveys of a further 8 watercourses and 2 water bodies, including an unnamed tributary watercourse of Fisherwick Brook (030-WC3-183001) where records of white-clawed crayfish have been recorded on nearby reaches (2006), has not established current presence of white-clawed crayfish as it passes within the area.

4.4.86 However confidence levels of absence are reduced on those watercourses where only limited access was available for survey (i.e.030-WC3-184001, 030-WC1-185001 and 030-WC1-191001) as it is possible that white-clawed crayfish populations could be missed if the watercourse reaches not yet subject to survey comprise more favourable localised habitat features and conditions.

4.4.87 Unsuitable habitat conditions for white-clawed crayfish (i.e. heavily shaded and chocked channel, acidic pH or dry) were found on two watercourses; the Mare Brook 030-WC-185001 and unnamed tributary watercourse of Mare Brook at Fradley Business Park 030-WC-186001, and all 10 water bodies surveyed and therefore absence is assumed on these watercourse reaches.

5 Fish

5.1 Introduction

5.1.1 This section of the appendix presents details of the baseline information relating to fish for the section of the Proposed Scheme that will pass through CFA16 to CFA22 inclusive.

5.2 Methodology

5.2.1 Fish survey requirements have been agreed in discussion with local Environment Agency teams.

5.2.2 Details of the standard methodology utilised for fish survey are provided in Ecology technical note: Ecological field survey methods and standards (Volume5: Appendix CT-001-000/2).

5.2.3 All fish surveys were undertaken using electric fishing techniques by either wading through the watercourse or through deployment of equipment from a boat depending on watercourse character and depth. A minimum of one electric fishing survey pass was conducted at each site, as per the methodology, along a predefined length of watercourse. Where a single survey pass was not considered likely to adequately describe the fish population present additional survey passes were conducted. This approach permitted, in most instances, the calculation of both density and standing crop estimates using the catch depletion methodology[31] providing a data set comparable to that collected by the Environment Agency.

5.2.4 Desk study records relating to fish were obtained from the following sources:

- Environment Agency routine sampling fisheries data; and
- Freshwater Fish Directive (FFD) watercourse classifications.

5.2.5 A summary of locations at which fish surveys were undertaken within the section of the Proposed Scheme that will pass through CFA16 to CFA22 inclusive is provided in Table 19, and shown in Volume 5: Map Books – Ecology, Maps EC-11.

5.2.6 To ensure consistency with Appendix EC-001-003 (section 6 River Habitat Survey and River Corridor Survey), the fish survey locations reported here are referenced by watercourse location as shown in the Volume 5: Map Books – Ecology, Maps EC-10.

Table 19: Summary of fish surveys conducted in CFA16 to CFA22 inclusive

Ecology survey code	Watercourse/feature	Survey date	Survey methods utilised	CFA	Distance from the Proposed Scheme (km) and orientation
030-FI1-119001	Unnamed tributary watercourse of the River Itchen (ordinary watercourse)	25 April 2013	Electric fishing (wading) – two passes over survey length of 100m	CFA16	Site located 0.65km upstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-081; C6).

[31] Carle, F. L. & Strub, M. R. (1978), A new method for estimating population size from removal data. *Biometrics* 34, 621-830.

Ecology survey code	Watercourse/feature	Survey date	Survey methods utilised	CFA	Distance from the Proposed Scheme (km) and orientation
030-Fl1-119002	River Itchen (ordinary watercourse)	03 April 2013	Electric fishing (wading) – three passes over survey length of 100m	CFA16	Site located 1.7km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-082; I7).
030-Fl1-120001	River Itchen (ordinary watercourse)	04 April 2013	Electric fishing (wading) – three passes over survey length of 100m	CFA16	Site located 0.95km upstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-082; I7).
030-Fl1-126002	River Itchen (ordinary watercourse)	03 June 2013	Electric fishing (boat) – three passes over survey length of 103m	CFA16	Site located 0.55km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-086; J5).
030-Fl1-133001	River Leam – Main river	25 April 2013	Electric fishing (boat) – four passes over survey length of 130m	CFA17	Site located 0.60km upstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-090; B6). Coincident with Environment Agency routine survey site at Hunningham.
030-Fl1-139001	River Avon (main river)	30 April 2013	Electric fishing (boat) – three passes over survey length of 180m	CFA18	Site located at the route crossing (Volume 5: Map Books – Ecology, Map EC-10-094; A6).
030-Fl1-141001	Finham Brook (main river)	09 April 2013	Electric fishing (wading) – three passes over survey length of 100m	CFA18	Site located at the route crossing (Volume 5: Map Books – Ecology, Map EC-10-095; A6).
030-Fl1-142001	Canley Brook – (main river)	10/04/13	Electric fishing (wading) – three passes over survey length of 180m	CFA18	Site located 0.15km upstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-096; C6). Section will be lost following proposed realignment of Canley Brook.
030-Fl1-161001	River Cole (main river)	23 April 2013	Electric fishing (wading) – three passes over survey length of 180m	CFA19	Site located 1.6km upstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-109; B6). Coincident with Environment Agency routine sampling site at Bacon's End.
030-Fl1-162001	River Cole (main river)	22 April 2013	Electric fishing – three passes over survey length of 180m	CFA19	Site located 0.69km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-109; B6). Site located in section of river which will be lost following realignment.

Ecology survey code	Watercourse/feature	Survey date	Survey methods utilised	CFA	Distance from the Proposed Scheme (km) and orientation
030-FI1-164001 and 164002	River Tame (main river)	24 April 2013	Electric fishing (wading and boat) – one pass over survey length of 130m	CFA19 and CFA20	Site located 1.8km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-111; C4).
030-FI1-171001	Langley Brook (ordinary watercourse)	05 April 2013	Electric fishing (wading) – three passes over survey length of 100m	CFA20	Site located 0.05km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-115; E6).
030-FI1-172001	Gallows Brook (ordinary watercourse)	19 April 2013	Electric fishing (wading) – three passes over survey length of 100m	CFA20 and CFA21	Site located 0.15km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-116; G6).
030-FI1-177001	Black Brook (main river)	1 May 2013	Electric fishing – (wading) – three passes over survey length of 100m	CFA21	Site located 0.15km upstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-120; B6).
030-FI1-183001	Unnamed tributary watercourse of the Fisherwick Brook (ordinary watercourse)	18 April2013	Electric fishing (wading) – one pass over survey length of 55m	CFA22	Site located 0.14km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-124; D6).
030-FI1-185001	Mare Brook (ordinary watercourse) –	02 May 2013	Electric fishing (wading) – one pass over survey length of 100m	CFA22	Site located 0.27km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-126; H3).
030-FI1-186001	Unnamed tributary watercourse of the Mare Brook (ordinary watercourse)	11 April 2013	Electric fishing (wading) – one pass over survey length of 60m	CFA22	Site located 0.05km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-126; D4). Located immediately downstream of proposed watercourse realignment.
030-FI1-188001	Curborough Brook (main river)	16 April 2013	Electric fishing (wading) – three passes over survey length of 100m	CFA22	Site located 1.4km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-127; B6).
030-FI1-190001	Bourne Brook (ordinary watercourse)	12 April 2013	Electric fishing (wading) – three passes over survey length of 100m	CFA22	Site located 0.19km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-129; F7).

5.3 Deviations, constraints and limitations

5.3.1 The use of a field based fisheries habitat survey approach to guide fish survey requirements has not been adopted due to variability in species habitat requirements and the transient nature of fish populations. Through discussion with the Environment Agency, a sampling programme has been developed that includes existing routine

Environment Agency monitoring sites (to ensure data continuity), key locations on assessed Water Framework Directive (WFD) water bodies[32], and sites on smaller watercourses considered likely to provide a valuable habitat resource for fish populations.

5.3.2 In light of the above, Fish Habitat Surveys (FHS) have been used alongside River Habitat Surveys (RHS) and River Corridor Surveys (RCS) to provide additional baseline data in support of the evaluation of watercourses habitat value (Volume 5: Appendix EC-001-003, Section 6) and not to define fish survey requirements as specified in the Ecology technical note: Ecological field survey methods and standards (Volume5: Appendix CT-001-000/2).

5.3.3 A summary of locations where requirement for fish survey was identified in discussion with the Environment Agency, but no access was available for survey is provided as Table 20.

Table 20: Summary of locations where requirement for fish survey identified but no access available for survey

Watercourse/feature	OS centroid grid reference	Description of proposed survey location	CFA	Distance from the Proposed Scheme[33] (km)
River Itchen (ordinary watercourse)	SP4003661290	Ordinary watercourse selected for survey in discussion with the Environment Agency. Crossed by route (Volume 5: Map Books – Ecology, Map EC-10-086; J5).	CFA16	0.5km upstream of the route crossing.
River Leam (main river)	SP3582066122	Main river selected for survey in discussion with the Environment Agency. Crossed by route (Volume 5: Map Books – Ecology, Map EC-10-090; B6). Site coincident with Environment Agency routine survey site at Offchurch, last sampled in 2009.	CFA17	2.2km downstream of the route crossing.
Unnamed tributary watercourse of the Langley Brook (ordinary watercourse)	SP1955097341	Ordinary watercourse selected for survey in discussion with the Environment Agency. Crossed by route (Volume 5: Map Books – Ecology, Map EC-10-113; B6).	CFA20	1.8km downstream of the route crossing.
Unnamed tributary watercourse of the Tame (ordinary watercourse)	SP1781399502	Ordinary watercourse selected for survey in discussion with the Environment Agency. Crossed by route (Volume 5: Map Books – Ecology, Map EC-10-116; C6).	CFA21	0.5km downstream of the route crossing.

5.4 Baseline

5.4.1 Fish survey results for CFA16 to22 are provided Table 21.

[32] WFD water bodies is a generic term for watercourses, standing water and groundwater.
[33] Distances for survey points are generally given upstream or downstream from the point at which the route of the Proposed Scheme will cross the watercourse.

Table 21: Summary results from fish surveys conducted in CFA16 to CFA22 inclusive

Ecology survey code	Watercourse	Description of location	Survey location (Upstream NGR)	Survey date	Average width (m)	Species	Survey results[34]	CFA
030-FI1-119001	Unnamed tributary watercourse of the River Itchen (ordinary watercourse)	0.65km upstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-081; C6).	SP4469156384	25 April 2013	1.5	Number of species = 3 Three-spined stickleback (*Gasterosteus aculeatus*); Minnow (*Phoxinus phoxinus*); and Bullhead (*Cottus gobio*).	Density = 3.00 no./100m^2 Biomass not measured due to presence of only minor species. No salmonid species recorded. Stream habitat homogenous with 100% open water and substrate dominated by find sand and compacted clay (80%). Species assessment – low numbers and impoverished assemblage. Species of conservation interest present (bullhead).	CFA16
030-FI1-119002	River Itchen (ordinary watercourse)	1.7km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-082; I7).	SP4296055695	03 April 2013	2.5	Number of species = 5 Three-spined stickleback; Minnow; Roach (*Rutilus rutilus*); Chub (*Leuciscus cephalus*); and Dace (*Leuciscus leuciscus*).	Density estimate = 1.2 no./100m^2 Standing crop estimate = 74.06 g/100m^2 No salmonid species recorded. Stream habitat homogenous with little cover for fish (open water 95%) and substrate dominated by find sands (100%). Species assessment – mixed fishery dominated by smaller species. Few larger species indicates stream capable of supporting a range of cyprinid taxa but habitat quality likely to be limiting.	CFA16

[34] Density estimates and standing crop estimates are provided where data was deemed suitable for catch depletion analysis, otherwise actual biomass or density value are provided.

Ecology survey code	Watercourse	Description of location	Survey location (Upstream NGR)	Survey date	Average width (m)	Species	Survey results[34]	CFA
030-FI1-120001	River Itchen (ordinary watercourse)	0.95km upstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-082; I7).	SP4471957230	04 April 2013	1.2	Number of species = 2 Three-spined stickleback; and Minnow.	Density = 17.14 no./100m^2 Biomass not measured due to presence of only minor species. No salmonid species recorded. Stream habitat homogenous with little cover for fish (open water 85%) and substrate dominated by find sands (80%) and clay (20%). Species assessment –very impoverished assemblage with only minor commonly occurring species recorded.	CFA16
030-FI1-126002	River Itchen (ordinary watercourse)	0.55km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-086; J5).	SP4052461835	03 June 2013	2.9	Number of species = 6 Roach; Pike (*Esox lucius*); Perch (*Perca fluviatilis*); Bullhead; Minnow; and Stoneloach (*Barbatula barbatula*).	Density estimate = 48.88 no./100m^2 Standing crop estimate = 3006.71 g/100m^2 No salmonid species recorded. Stream habitat homogenous (run 99%) with substrates dominated by gravel (80%). Species assessment – species rich mixed coarse fishery with high standing crop due mainly to the presence of large numbers of roach. Large numbers of roach were a notable feature which may be a result of pre-spawning aggregation of this species. Species of conservation interest present (bullhead).	CFA16

Ecology survey code	Watercourse	Description of location	Survey location (Upstream NGR)	Survey date	Average width (m)	Species	Survey results[34]	CFA
030-Fl1-133001	River Leam (main river)	0.60km upstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-090; B6). Coincident with Environment Agency routine survey site at Hunningham.	SP3619367734	25 April 2013	8.3	Number of species = 8 Brook lamprey (*Lampetra planeri*); Bullhead; Chub; Dace; Minnow; Pike (*Esox lucius*); Roach; and Stone loach (*Barbatula barbatula*).	Density = 3.88 no./100m^2 Biomass = 583.86 g/100m^2 Good numbers of roach, dace and pike. No salmonid species recorded although brook lamprey present, a species of low tolerance to environmental disturbance which is notable. Stream dominated by run type habitat (80%) and substrate dominated by gravel and fine sands (100%). Some limited cover in the form of submerged aquatic and branches. Species assessment – mixed coarse fishery containing a wide range of species, including the locally uncommon brook lamprey.	CFA17
030-Fl1-139001	River Avon (main river)	At route crossing (Volume 5: Map Books – Ecology, Map EC-10-094; A6).	SP3216272151	30 April 2013	17.7	Number of species = 6 European eel (*Anguilla anguilla*); Common carp (*Cyprinus carpio*); Common bream (*Abramis brama*); Pike (*Esox lucius*); Perch (*Perca fluviatilis*); and Stone loach.	Density estimate = 0.72 no./100m^2 Standing crop estimate = 103.89 g/100m^2 No salmonid species recorded. Stream habitat homogenous (100%) with submerged (15%) and narrow/broadleaved vegetation (15%) present. Substrate dominated by fine sands (100%). Species assessment – majority of species are characteristic deep slow flowing river reaches and have a high to medium tolerance to environmental disturbance. Overall a mixed coarse fishery with species of conservation interest present (eel).	CFA18

Ecology survey code	Watercourse	Description of location	Survey location (Upstream NGR)	Survey date	Average width (m)	Species	Survey results[34]	CFA
030-FI1-141001	Finham Brook (main river)	At route crossing (Volume 5: Map Books – Ecology, Map EC-10-095; A6).	SP3103973265	09 April 2013	5.2	Number of species = 3 Brown trout (*Salmo trutta*); Bullhead; and Stone loach.	Density estimate = 3.10 no./100m^2 Standing crop estimate = 321.78 g/100m^2 Salmonid species recorded. Stream habitat characterised by riffle/pool sequences and diverse bed substrate. Species assessment – although species poor the assemblages is indicative of good habitat quality and species have a low to medium tolerance to environmental disturbance. Species of conservation interest present (bullhead).	CFA18
030-FI1-142001	Canley Brook (main river)	0.15km upstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-096; C6). Section which will be lost following proposed realignment of Canley Brook.	SP3009074074	10 April 2013	3.3	Number of species = 2 Brown trout; and Bullhead.	Density estimate = 6.90 no./100m^2 Standing crop estimate = 706.08 g/100m^2 Salmonid species recorded. Stream habitat characterised by riffle/pool and run sequences and diverse bed substrate. Species assessment – although species poor, the assemblages is indicative of good habitat quality with 23 brown trout recorded at survey. Both species have a low tolerance to environmental disturbance. Species of conservation interest present (bullhead).	CFA18

Ecology survey code	Watercourse	Description of location	Survey location (Upstream NGR)	Survey date	Average width (m)	Species	Survey results[34]	CFA
030-Fl1-161001	River Cole (main river)	1.6km upstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-109; B6). Coincident with Environment Agency routine sampling site at Bacon's End.	SP1900288031	23 April 2013	8.0	Number of species = 9 Minnow; Gudgeon (*Gobio gobio*); Chub; Dace; Stone loach; Perch; Three-spined stickleback; Roach; and Bullhead.	Density estimate = 9.25 no./100m^2 Standing crop estimate = 622.31 g/100m^2 No salmonid species recorded. Stream habitat characterised by the presence of run and pool habitats with little cover for fish (open water 95%) and substrate dominated by gravel (95%). Species assessment – A mixed coarse fishery with an abundance of minor species (e.g. minnow and gudgeon), although larger rheophilic coarse species such as chub and dace were recorded in relatively low numbers. Species of conservation interest present (bullhead).	CFA19
030-Fl1-162001	River Cole (main river)	0.69km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-109; B6). Site located in section of river which will be lost following realignment.	SP1935789561	22/04/13	9.4	Number of species = 8 Minnow; Gudgeon; Nine-spined stickleback (*Gasterostreus aculeatus*); Stone loach; Perch; Three-spined stickleback; Roach; and Bullhead.	Density = 6.49 no./100m^2 Biomass = 14.01 g/100m^2 No salmonid species recorded. Stream habitat characterised by the presence of run and riffle habitats with little cover for fish (open water 95%). Substrate dominated by gravel (90%) with some sand and cobble. Species assessment – A mixed coarse fishery with an abundance of minor species (of which stoneloach were the most abundant). Larger species limited to very low numbers of perch and one roach. Species of conservation interest present (bullhead).	CFA19

Ecology survey code	Watercourse	Description of location	Survey location (Upstream NGR)	Survey date	Average width (m)	Species	Survey results[34]	CFA
030-Fl1-164001	River Tame (main river)	1.8km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-111; C4).	SP2065191393	24 April 2013	19.0	Number of species = 5 Minnow; Gudgeon; Stoneloach; Three-spined stickleback; and Bullhead.	Density = 0.52 no./100m^2 Biomass = 10.51 g/100m^2 No salmonid species recorded. Five of the commonly occurring smaller species recorded, including bullhead. Stream habitat homogenous with little cover for fish (open water 95%) and substrate dominated by gravel (80%) and cobble (20%). Species assessment – commonly occurring minor species only including a species of conservation interest present (bullhead).	CFA19 and CFA20
030-Fl1-164002	River Tame (main river)	1.8km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-111; C4).	SP2065191393	24 April 2013	19.0	Number of species = 2 Common carp; and Rainbow trout (*Oncorhynchus mykiss*).	Survey from boat to supplement above survey. One common carp captured, two further observed and one rainbow trout observed. Rainbow trout is a non-native species.	CFA19 and CFA20

Ecology survey code	Watercourse	Description of location	Survey location (Upstream NGR)	Survey date	Average width (m)	Species	Survey results[34]	CFA
030-FI1-171001	Langley Brook (ordinary watercourse)	0.05km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-115; E6).	SP1854498171	05 April 2013	2.2	Number of species = 7 Three-spined stickleback Stoneloach Minnow Bullhead Gudgeon Perch Roach	Density = 33.23 no./100m^2 Biomass = 133.11 g/100m^2 No salmonid species recorded. Stream habitat shows some heterogeneity (90% run; 5% riffle; 5% pool) and provides little cover for fish (open water 99%). Substrate is dominated by fine sands (95%) and gravels (5%). Species assessment – mixed coarse fishery dominated by minor species, but capable of supporting larger species as evidenced by the presence of perch and roach.	CFA20
030-FI1-172001	Gallows Brook (ordinary watercourse)	0.15km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-116; G6).	SP1815299056	19 April 2013	0.80	Number of species = 1 Three-spined stickleback	Density = 1.28 no./100m^2 Biomass = 1.98 g/100m^2 Only a single three-spined stickleback was recorded during survey. Watercourse dominated by riffle type habitat (80%) and substrate by fine sands (100%). Some limited in-channel cover in the form of submerged aquatic and branches. Species assessment –species poor fish community, only a single three-spined stickleback – a ubiquitous species – recorded.	CFA20 and CFA21

Ecology survey code	Watercourse	Description of location	Survey location (Upstream NGR)	Survey date	Average width (m)	Species	Survey results[34]	CFA
030-FI1-177001	Black (main river)	0.15km upstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-120; B6).	SK1502503531	01 May 2013	3.9	Number of species = 4 Stone loach Three-spined stickleback Bullhead Nine-spined stickleback	Density = 54.36 no./100m^2 Biomass not measured due to presence of only minor species. Good numbers of stone loach and three-spined stickleback, with a lower abundance of bullhead and nine-spined stickleback. Watercourse dominated by run type habitat (75%) and substrate by fine sands (90%). Some limited in-channel cover in the form of submerged aquatic and branches. Species assessment – species poor coarse fishery with only commonly occurring minor species recorded.	CFA21
030-FI1-183001	Unnamed tributary watercourse of the Fisherwick Brook (ordinary watercourse)	0.14km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-124; D6).	SK1484509073	18 April 2013	1.8	Number of species = 5 Three-spined stickleback Bullhead Chub Minnow Stone loach	Density = 283.63 no./100m^2 Biomass = 45.56 g/100m^2 Assemblage dominated by minor species such. Larger coarse fish species limited to low numbers of chub, of which four where recorded at survey. No salmonid species recorded. Stream characterised by the presence of run and riffle habitat with little cover for fish (open water 95%) and substrate dominated by find sands (90%). Species assessment – dominated by minor commonly occurring species with larger cyprinids limited to a few chub.	CFA22

Ecology survey code	Watercourse	Description of location	Survey location (Upstream NGR)	Survey date	Average width (m)	Species	Survey results[34]	CFA
030-FI1-185001	Mare Brook (ordinary watercourse)	0.27km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-126; H3).	SK1457511156	02 May 2013	0.8	Number of species = 2 Three-spined stickleback Bullhead	Density = 15.65 no./100m^2 Biomass not measured due to presence of only minor species. Only two species recorded, namely, bullhead and three-spined stickleback, both at low density. No salmonid species recorded. Heavily shaded stream section with homogenous channel (run 100%) with branches and coarse detritus present throughout. Species assessment – impoverished fish assemblage.	CFA22
030-FI1-186001	Unnamed tributary watercourse of the Mare Brook (ordinary watercourse)	0.05km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-126; D4). Located immediately downstream of proposed watercourse realignment.	SK1419511829	11 April 2013	1.0	Number of species = 2 Three-spined stickleback Nine-spined stickleback	Density = 73.33 no./100m^2 Biomass not measured due to presence of only minor species. Only two species recorded, namely, three-spined stickleback and nine-spined stickleback, both at low density. No salmonid species recorded. Heavily shaded stream section with homogenous channel (run 100%) with coarse detritus present along 60% of survey reach. Species assessment –impoverished fish assemblage.	CFA22

Ecology survey code	Watercourse	Description of location	Survey location (Upstream NGR)	Survey date	Average width (m)	Species	Survey results[34]	CFA
030-FI1-188001	Curborough Brook (main river)	1.4km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-127; B6).	SK1333414636	16 April 2013	3.3	Number of species = 4 Three-spined stickleback Chub Minnow Roach	Density estimate = 1.84 no./100m^2 Standing crop estimate = 53.56 g/100m^2 Four species recorded but only limited numbers of larger coarse species, namely chub and roach. No salmonid species recorded. Homogenous channel (run 99%) with in-channel cover limited to 2% sub-merged macrophytes. Species assessment – species poor but capable of supporting larger cyprinids.	CFA22
030-FI1-190001	Bourne Brook (ordinary watercourse)	0.19km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-129; F7).	SK1081914296	12 April 2013	2.9	Number of species = 2 Brown trout Bullhead	Density estimate = 1.03 no./100m^2 Standing crop estimate = 356.73 g/100m^2 Only two species recorded, namely, bullhead and brown trout. A total of three brown trout recorded, up to 336mm in length. Bullhead abundant with 254 recorded at survey. Homogenous channel although containing varied substrate character. Species assessment – although species poor the stream is potentially utilised by trout as a spawning area and therefore may be one of limited number of potential salmonid recruitment sites in the area.	CFA22

CFA16 Ladbroke and Southam

Desk study

5.4.2 The River Itchen and Oxford Canal are designated as salmonid and cyprinid waters, respectively, under the Freshwater Fish Directive (FFD) (2006/44/EC).

5.4.3 No Environment Agency fisheries data is available for this area.

Survey data

5.4.4 In summary the following sites were selected for fish survey:

- unnamed tributary watercourse of the River Itchen (Volume 5: Map Books – Ecology, Map EC-10-081; C6); and
- four sites on the River Itchen.

5.4.5 No desk study fish survey data is available for this area. Fish survey data collected in 2013 has identified the presence of fish assemblages of variable quality on the River Itchen and associated tributary watercourses.

5.4.6 These range from species poor assemblages dominated by only minor species in the upper reaches (030-FI1-119001 and 030-FI1-120001), to more species rich assemblages containing larger cyprinid species (030-FI1-119002 and 030-FI1-126002) associated with the larger watercourse sections.

5.4.7 Species of conservation interest, namely bullhead (Habitats Directive Annex II species[35]), appear to be well distributed through the River Itchen catchment.

CFA17 Offchurch and Cubbington

Desk study

5.4.8 The River Leam and Grand Union Canal are designated as cyprinid waters under the Freshwater Fish Directive (FFD) (2006/44/EC). Environment Agency fisheries data is limited to three sites on the River Leam in this area with the most recent data being collected in 2009, as presented in Table 22.

[35] Species listed on Annex II of the Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora (the Habitats Directive). This is the means by which the European Community meets its obligations as a signatory of the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention). In the UK the Directive has been transposed into national laws by means of the Conservation (Natural Habitats, & c.) Regulations 1994 (as amended) as consolidated by The Conservation of Habitats and Species Regulations 2010 (as amended – the Habitats Regulations). Annex II species are rare/threatened on a European level.

Table 22: Environment Agency fish survey data by WFD water body in CFA17

Water body	WFD water body ID	Site name (Site ID) and NGR	Period of record (No. of records)	Details of most recent survey
River Leam	GB109054044140	Red Lion, Hunningham (UA_LEM_XXX_008) SP3717068683	09 July 2002 to 18 June 2008 (6)	Site located 2.7km upstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-081; C6) Number of species = 12 Density estimate = 9.56 no./100m^2 Standing crop estimate = 1325.63 g/100m^2 Species of interest recorded: Bullhead; and European eel.
		Hunningham, d/s the Mill (UA_LEM_XXX_009) SP3619667740	09 July 2002 to 27 August 2009 (6)	Site located 0.60km upstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-081; C6)Number of species = 8 Density estimate = 5.29 no./100m^2 Standing crop estimate = 981.55 g/100 m^2 Species of interest recorded: Bullhead.
		Offchurch (UA_LEM_XXX_011) SP3582066122	09 July 2002 to 12 September 2009 (7)	Site located 2.2km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-081; C6)Number of species = 9 Species of interest recorded: European eel.

5.4.9 Environment Agency fisheries data for the River Leam shows the presence of a mixed coarse fishery with a maximum of 12 species recorded in the most recent survey period. Species of conservation interest, namely bullhead (Habitats Directive Annex II species) and the declining European eel (a species of principal importance identified in Section 41 of the Natural Environment and Rural Communities (NERC) Act (2006)[36]) have been recorded, the former being identified as being well distributed within the river.

Survey data

5.4.10 Sites selected for fish survey include two of the routine Environment Agency monitoring sites on the River Leam at Offchurch and Hunningham, that were most recently sampled in 2009:

- River Leam – Environment Agency routine monitoring site at Offchurch (UA_LEM_XXX_011); and
- River Leam – Environment Agency routine monitoring site at Hunningham (UA_LEM_XXX_009).

[36] *Natural Environment and Rural Communities Act* 2006 (Chapter 16), Her Majesty's Stationery Office.

5.4.11 Fish survey data for the River Leam (030-FI1-133001) at Hunningham are comparable to the Environment Agency data obtained from the same site in 2009. Eight species where recorded including good numbers of roach, dace and pike, in addition to commonly occurring minor species (e.g. minnow). Density and standing crop estimates (3.88 no./100m^2 and 583.86 g/100m^2, respectively) are relatively high and comparable to the Environment Agency data.

5.4.12 Notable species include bullhead, which is well distributed through the River Leam, and brook lamprey (both Habitats Directive Annex II species), which has not previously been recorded at this survey site.

CFA18 Stoneleigh, Kenilworth and Burton Green

Desk study

5.4.13 The River Avon is designated as a cyprinid water under the Freshwater Fish Directive (FFD) (2006/44/EC).

5.4.14 Fisheries data is available for three sites on the River Avon (WFD water body GB109054043920), as presented in Table 23, all of which are located within 4km of the route of the Proposed Scheme, the nearest site being the National Agricultural Centre at Stoneleigh (1.5km upstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-094; A6)).

Table 23: Environment Agency fish survey data by WFD water body

Water body	WFD water body ID	Site name (Site ID) and NGR	Period of record (No. of records)	Details of most recent survey
River Avon	GB109054043920	National Agricultural Centre, Stoneleigh (UA_AVO_XXX_032a) SP3288471516	22 August 2002 to 29 September 2004 (3)	Site located 1.46km upstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-094; A6). Number of species = 8 Density estimate = 2.037 no./100m^2 Standing crop estimate = 1312.11 g/100m^2 Species of interest recorded: European eel.
		Stareton Gauging Station (UA_AVO_XXX_032) SP3327571558	22 August 2004 to 07 July 2009 (7)	Site located 1.9km upstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-094; A6). Number of species = 9 Density estimate = 19.9 no./100m^2 Standing crop estimate = 6326.96 g/100m^2 Species of interest recorded: brown trout (Salmo trutta) and bullhead (Cottus gobio).

Water body	WFD water body ID	Site name (Site ID) and NGR	Period of record (No. of records)	Details of most recent survey
		U/S Cloud Bridge (UA_AVO_XXX_030a) SP3469272428	12 September 2002 to 07 July 2009 (6)	Site located 3.9km upstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-094; A6).Number of species = 9 Density estimate = 3.75 no./100m^2 Standing crop estimate = 1978.173 g/100m^2 Species of interest recorded: Grayling (*Thymallus thymallus*); and Bullhead.

5.4.15 Environment Agency fisheries data identify the River Avon as supporting a predominantly mixed coarse fishery, although salmonid species (brown trout and grayling) are present in low numbers. Species of conservation interest, namely bullhead and European eel have also been recorded. However, the age of surveys mean that they are not necessarily representative of the present community in the vicinity of the route crossing.

Survey data

5.4.16 Fish survey requirements have been determined through consultation with the Environment Agency. Sites selected for fish survey include main river sites that are crossed by the Proposed Scheme in addition to smaller stream systems which were considered likely to provide a valuable habitat resource as either spawning/nursery habitat and/or as sites of refuge from high flows. Canals were excluded from fish survey requirement in consultation with the Environment Agency.

5.4.17 One site on each of the following watercourses was selected for fish survey:

- River Avon;
- Canley Brook; and
- Finham Brook.

5.4.18 All fish surveys were completed for this area. Fish survey results for this area are provided in Table 21.

5.4.19 Fish survey data for the River Avon (030-FI1-139001) is comparable to Environment Agency data available for the River Avon in that it has identified the presence of mixed coarse fishery characteristic of deep slow flowing river reaches dominated by species with a high to medium tolerance to environmental disturbance. Desk study has shown the River Avon to support salmonids and species of conservation interest including the declining European eel (species of principal importance) and bullhead (Habitats Directive Annex II species).

5.4.20 Fish survey data for the Finham Brook and Canley Brook show these watercourses exhibit similar species assemblages and are indicative of good habitat quality, with both brown trout and bullhead being recorded, with generally higher fish densities observed in the Canley Brook (6.90 no./100m^2). Brown trout and bullhead exhibit a

low tolerance to environmental disturbance. The presence of brown trout is an uncommon feature of watercourses in this area

CFA19 Coleshill Junction

Desk study

5.4.21 The River Cole and River Tame are both designated as cyprinid waters under the Freshwater Fish Directive (FFD) (2006/44/EC). Environment Agency fisheries data relevant to this area is limited to three sites on the River Cole sampled between 2004 and 2010 and one site on the River Tame sampled between 2005 and 2011 (Table 24).

Table 24: Environment Agency fisheries data by WFD water body

Water body	WFD water body ID	Site name (Site ID) and NGR	Period of record (No. of records)	Details of most recent survey
River Cole	GB104028042420	Bacon's End SP1839688007	28 July 2004 (1)	Site located 2.7km upstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-109; B6). Number of species = 7 Density estimate = 9.919 no./100m^2 Standing crop estimate = 824.209 g/100m^2 No species of conservation interest recorded
		Coleshill Manor SP1861688924	21 July 2004 to 29 April 2010 (2)	Site located 0.46km upstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-109; B6).Number of species = 5 Density estimate = 144.857 no./100m^2 Standing crop estimate = 659.893 No species of conservation interest recorded
		Coleshill SP2013990592	20 July 2004 (1)	Site located 3.0km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-109; B6). Number of species = 9 Density estimate = 68.646 no./100m^2 Standing crop estimate = 7234.383 g/100m^2 Species of interest recorded: Bullhead.
River Tame	GB104028046840	Water Orton SP1695291443	19 July 2005 to 28 June 2011 (2)	Site located 2.5km upstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-111; C4). Number of species = 5 Density estimate = 0.059 no./100m^2 Standing crop estimate = 0.441 g/100m^2 Species of interest recorded: Bullhead.

5.4.22 Environment Agency fish surveys on the River Cole have yielded a total of nine species, including bullhead, a species of conservation interest (Habitats Directive Annex II species), from the Coleshill site. Of particular note is the very high standing crop estimate from the 2004 Coleshill survey (7234.383 g/100m^2) arising from the capture of a large number of adult chub. No salmonid species were recorded on the River Cole.

5.4.23 Environment Agency fisheries data for the River Tame (Water Orton 2011 survey) shows the river supports a very limited species poor assemblage with only five species recorded, including bullhead, a species of conservation interest. The impoverished nature of the fish assemblage is evidenced through the low standing crop (0.441 g/100m^2) and density estimates (0.059 no./100m^2). No salmonid species were recorded on the River Tame.

Survey data

5.4.24 The following sites were selected for fish survey in this area:

- two sites on the River Cole (including a site located on the section of river that will be lost as a result of the Proposed Scheme realignment); and
- River Tame.

5.4.25 All fish surveys were completed for this area. Fish survey results for this area are provided in Table 21.

5.4.26 Survey data for the River Cole, collected within 2km of the route of the Proposed Scheme route crossing (Volume 5: Map Books – Ecology, Map EC-10-109; B6), have shown the fish assemblage as being dominated by minor, commonly occurring species. Larger rheophilic cyprinids were recorded at survey e.g. chub and dace, but only in low number at 030-FI1-161001. The dominance of the assemblage at 030-FI1-162001 by minor species is evidenced by the low biomass values obtained at this site (14.01 g/100m^2). The majority of species recorded during survey exhibit a high to medium tolerance to environmental disturbance. No salmonid species were recorded at survey, although the well distributed species of conservation interest, bullhead, was recorded. Survey results are broadly comparable to Environment Agency desk study data with smaller, minor species dominating.

5.4.27 Fish survey data for the River Tame identified the presence of a species poor assemblage containing predominantly commonly occurring, minor species. These were recorded at low abundance (Density at 030-FI1-164001 = 0.52 no./100m^2). Species of conservation interest were limited to bullhead, which were recorded in both the desk study surveys and surveys undertaken in 2013. This species is well distributed throughout the River Tame and is therefore considered as a commonly occurring species.

CFA20

Desk study

5.4.28 The River Tame and the Birmingham and Fazeley Canal are designated as cyprinid waters under the Freshwater Fish Directive (FFD) (2006/44/EC). Environment Agency

fisheries data is limited to one site on the River Tame in this area with the most recent data being collected in 2011 (Table 21).

Table 25: Environment Agency fish survey data by WFD water body in CFA20

Water body	WFD water body ID	Site name (Site ID) and NGR	Period of record (No. of records)	Details of most recent survey
River Tame	GB104028046840	Water Orton SP1695291443	19 July 2005 and 28 June 2011 (2)	Site located 2.5km upstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-111; C4). Number of species = 5 Density estimate = 0.059 no./100m^2 Standing crop estimate = 0.441 g/100m^2 Species of interest recorded: Bullhead.

5.4.29 The River Tame is assessed as poor for fish under the WFD. Fisheries data show the River Tame as supporting a low density species poor population with only five species recorded in the 2011 survey. Bullhead, a species of conservation interest (Habitats Directive Annex II species) was recorded at survey. No salmonid species we recorded in either the 2005 or 2011 survey.

Fish Survey data

5.4.30 Sites selected for fish survey include:

- one site on the River Tame;
- one site on the unnamed tributary watercourse of the Langley Brook (Volume 5: Map Books – Ecology, Map EC-10-113; B6);
- one site on the Langley Brook; and
- one site on the Gallows Brook.

5.4.31 Available desk study and results from fish surveys on the River Tame have identified the presence of a species poor fish assemblage dominated by minor, commonly occurring species which were recorded at a noticeably low density and standing crop (density estimated from 2013 survey = 0.52 no./100m^2). Species of conservation interest are limited to records of bullhead in the Environment Agency survey conducted in 2007 approximately 2.5km upstream of the route of the Proposed Scheme.

5.4.32 No desk study data is available for the Langley Brook. Fish survey identified the presence of a mixed coarse fishery dominated by minor, commonly occurring species, but capable of supporting larger species as evidenced by the presence of perch and roach.

5.4.33 Survey for the Gallows Brook revealed the presence of a significantly impoverished fishery with only a single three-spined stickleback recorded at survey; a species with a high tolerance to environmental disturbance.

CFA21 Drayton Bassett, Hints and Weeford

Desk study

5.4.34 No designations under the Freshwater Fish Directive (FFD) (2006/44/EC) have been identified for watercourses in this area. Environment Agency fisheries data are available for three sites on the Black-Bourne Brook, as presented in Table 26.

Table 26: Environment Agency fish survey data by WFD water body in CFA21

Water body	WFD water body ID	Site name (Site ID) and NGR	Period of record (No. of records)	Details of most recent survey
Black-Bourne Brook from source (confluence with River Tame)	GB104028047000	Hints SK1620202554	28 September 2004 (1)	Site located 1.7km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-120; B6). Number of species = 8 Density estimate = 8.5 no./100m^2 Standing crop estimate = 655.661 g/100m^2 Species of interest recorded: Brown trout; and Bullhead.
		Lodge Farm SK1830301380	22 September 2004 (1)	Site located 4.5km downstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-120; B6).Number of species = 8 Density estimate = 59.4 no./100m^2 Standing crop estimate = 3010.503 g/100m^2 Species of interest recorded: Brown trout; and Bullhead.
		Thickbroome SK1256003438	21 September 2004 (1)	Site located 2.6km upstream of the route crossing (Volume 5: Map Books – Ecology, Map EC-10-120; B6).Number of species = 6 Density estimate = 5.185 no./100m^2 Standing crop estimate = 1488.672 g/100m^2 Species of interest recorded: Brown trout; and Bullhead

5.4.35 The monitoring site at Hints, which was most recently surveyed in 2004, is closest to the Proposed Scheme footprint being located approximately 1.7km downstream of the Proposed Scheme route crossing (Volume 5: Map Books – Ecology, Map EC-10-120; B6).

5.4.36 This survey identified this reach of the Black-Bourne Brook as supporting a mixed fishery with a total of seven species recorded, of which roach were notably abundant. Species of conservation interest included bullhead (an Annex II Habitats Directive

species) and brown trout. Records of brown trout at all the Environment Agency monitoring sites indicate that this species is well distributed through the brook.

Survey data

5.4.37 Sites selected for fish survey in this area include:

- a single site on the Gallows Brook;
- a single site on the unnamed tributary watercourse of the River Tame (Volume 5: Map Books – Ecology, Map EC-10-116; C6); and
- a single site on the Black Brook, coincident with an Environment Agency monitoring site (Hints, last sampled in 2004) – subsequently moved downstream due to access constraints.

5.4.38 Fisheries survey for the Gallows Brook (030-FI1-172001) recorded only a single three-spined stickleback indicating an impoverished assemblage.

5.4.39 Fisheries survey data for the Black Brook is similar to the Environment Agency data obtained for neighbouring sites, in that the assemblages are generally species poor. However, brown trout which were present at all Environment Agency sampling sites in 2004, were absent from the 2013 survey (030-FI1-177001). Bullhead, although apparently well distributed throughout the river based on existing Environment Agency data, is notable in that it is a Habitats Directive Annex II species.

CFA22 Whittington to Handsacre

Desk study

5.4.40 The Trent and Mersey Canal, Wyrley and Essington Canal and the Coventry Canal are all designated as cyprinid waters under the Freshwater Fish Directive (FFD) (2006/44/EC).

5.4.41 No Environment Agency fisheries data is available for watercourses in this area.

Survey data

5.4.42 Sites selected for fish survey include:

- unnamed tributary watercourse of the Fisherwick Brook (Volume 5: Map Books – Ecology, Map EC-10-124; D6);
- Mare Brook;
- unnamed tributary watercourse of the Mare Brook (Volume 5: Map Books – Ecology, Map EC-10-126; D4);
- Curborough Brook; and
- Bourne Brook.

5.4.43 Fish survey results identify all sample sites as being characterised by the presence of species poor communities, with a maximum of five species recorded at 030-FI1-183001. The majority of fish survey sites where characterised by the presence of smaller, minor species with a high tolerance to environmental disturbance e.g. three-

spined stickleback. Larger cyprinid species such as roach and chub were infrequently recorded, and where observed, only at low abundance.

5.4.44 Species of conservation interest, namely bullhead (Habitats Directive Annex II species), appear to be well distributed within the catchment area surveyed.

5.4.45 The fish assemblage of the Bourne Brook (030-FI1-190001) is notable for this area on account of the numerous bullhead recorded (No. 254) and the presence of salmonid species, namely, brown trout.